

Cyanobacteria in Wisconsin: their identification, potential health effects, and determination of safe levels for recreation

**2018 Wisconsin Lakes Partnership
Convention Workshop**

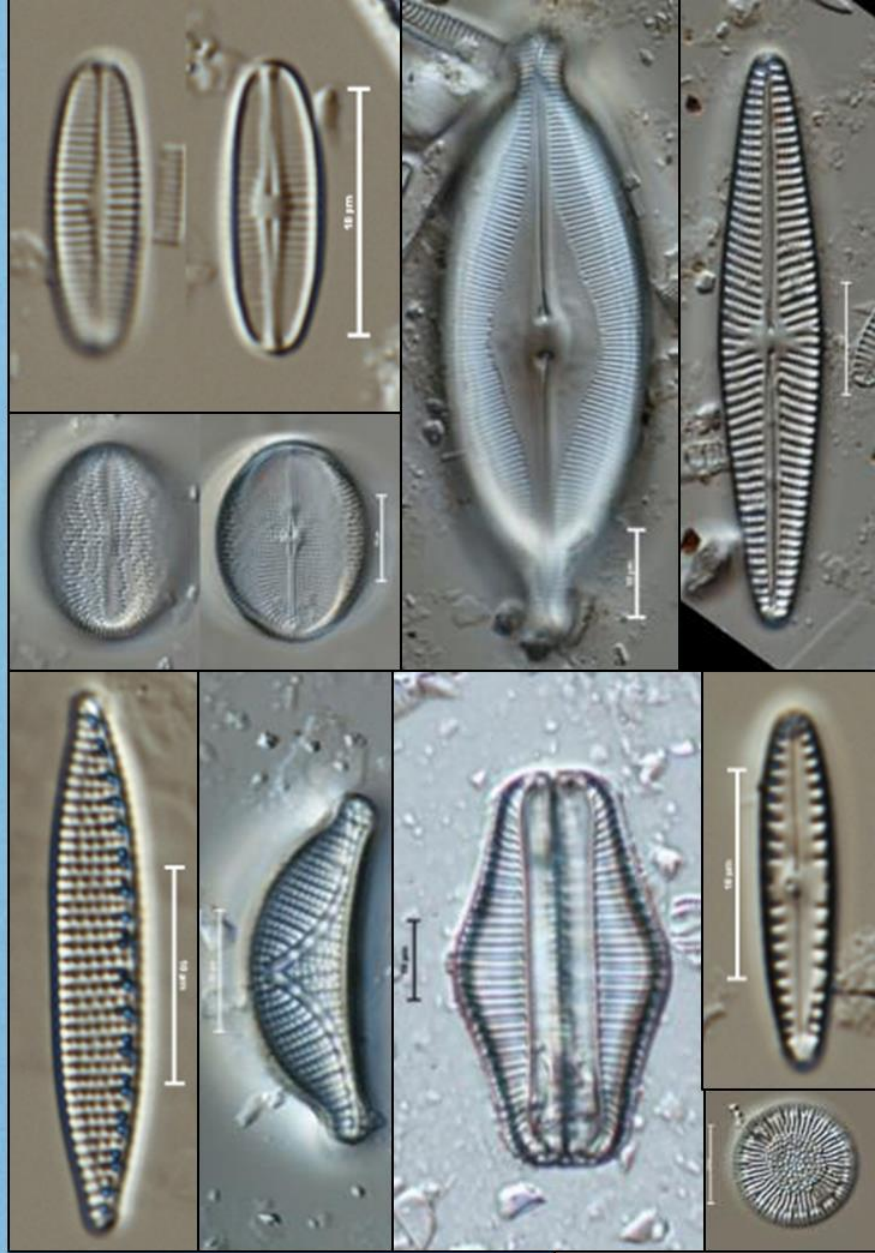
**Gina LaLiberte
Wisconsin Department of Natural Resources**

Gina.LaLiberte@wisconsin.gov

All photos by Gina LaLiberte unless otherwise attributed.

Workshop Agenda

- Introductions
- Resources
- Caveats
- Cyanobacteria & algae background
- Hands-on
- Health impacts & recreational guidelines





T. Johnson



Taxonomic Resources



FRESHWATER ALGAE OF THE UNITED STATES - SMITH

Freshwater Algae of North America

ALGAE OF THE WESTERN GREAT LAKES AREA
PRESCOTT

PRESCOTT HOW TO KNOW THE FRESHWATER ALGAE

FRESH-WATER ALGAE
WHITFORD / SCHUMACHER

PRESCOTT
CROSSDALE
VINYARD

A Synopsis of North American Desmidiaceae
Part II. Desmidiaceae: Placodesmata (Section 1)

PRESCOTT
CROSSDALE
VINYARD

A Synopsis of North American Desmidiaceae
Part II. Desmidiaceae: Placodesmata (Section 2)

QK 569 D48 P72 pt.2 sec.1

QK 570.25 B45 2010

RES QK 569 D48 P72 pt.2 sec.1

RES QK 569 D48 P72 pt.2 sec.2



THE SPARKS PRESS

5-857-0093

571
P67

1950

How To Know

THE FRESH-WATER ALGAE

An illustrated key for identifying the more common Fresh-water Algae to genus, with hundreds of species named and pictured and with numerous aids for their study.

by

G. W. PRESCOTT, Ph.D.
Professor of Botany
Michigan State University

*Woods Hole Oceanographic Institution
Clark Reading Room*



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BIOLOGICAL
LABORATORY

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DUBUQUE, IOWA

ALGAE

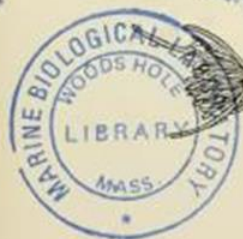
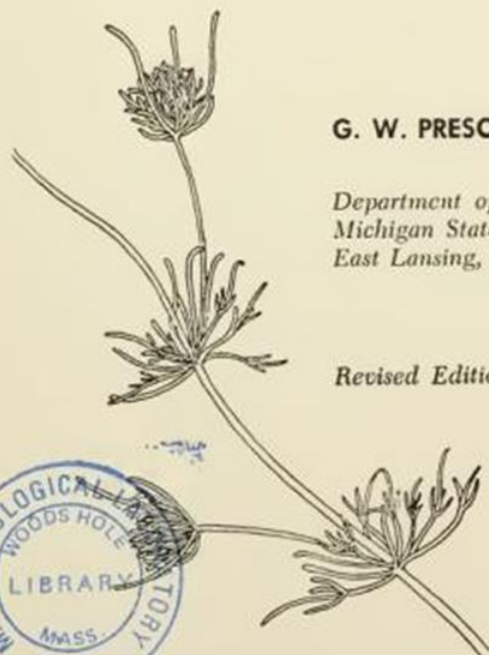
OF THE WESTERN GREAT LAKES AREA

With an Illustrated Key to the Genera of Desmids and Freshwater Diatoms

G. W. PRESCOTT, Ph.D.

*Department of Botany and Plant Pathology
Michigan State University
East Lansing, Michigan*

Revised Edition



WM. C. BROWN COMPANY PUBLISHERS
Dubuque, Iowa

Freshwater Algae

Identification, Enumeration and Use as Bioindicators

Second Edition

Edward G. Bellinger

*Department of Environmental Sciences and Policy,
Central European University, Hungary*

and

David C. Sigeo

*School of Earth, Atmospheric and Environmental Sciences,
University of Manchester, UK*

WILEY Blackwell

Freshwater Algae of North America

Ecology and Classification

Edited by

John D. Wehr

*Louis Calder Center—Biological Station
Fordham University
Armonk, New York, USA*

Robert G. Sheath

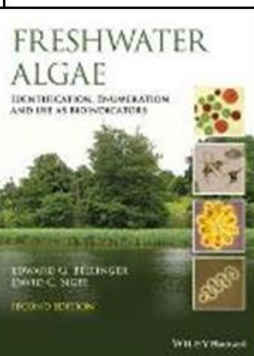
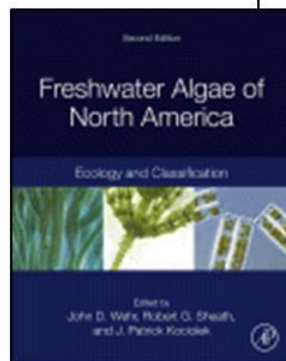
*Department of Biological Sciences
California State University San Marcos
San Marcos, California, USA*

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*Department of Ecology and Evolutionary Biology and Museum of Natural History
University of Colorado
Boulder, Colorado, USA
University of Michigan Biological Station
Pellston, Michigan, USA*



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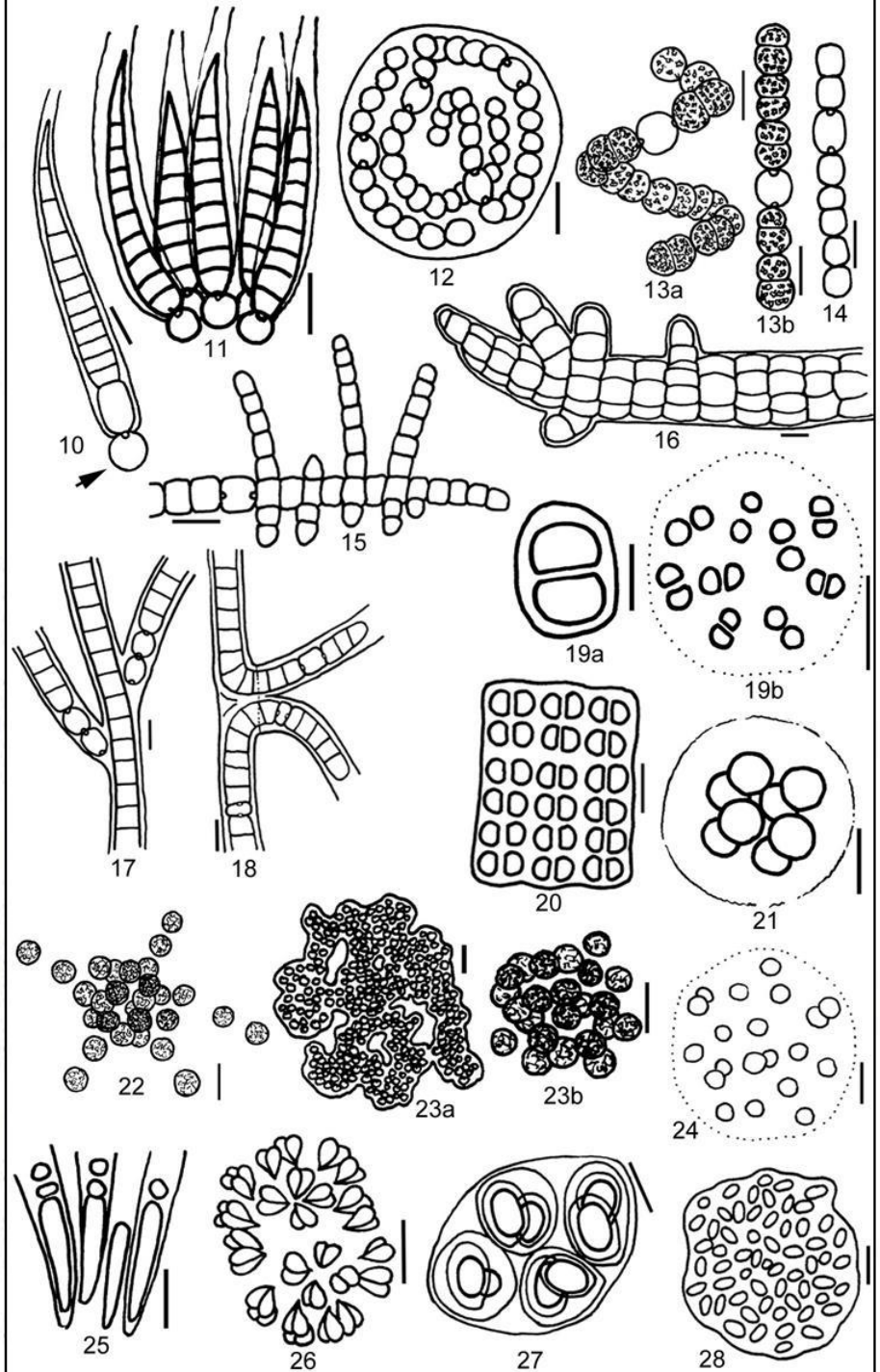


Third Edition

Methods in Stream Ecology

Volume 1: Ecosystem Structure

Edited by
F. Richard Hauer
Gary A. Lamberti



Field and Laboratory Guide to Freshwater Cyanobacteria Harmful Algal Blooms for Native American and Alaska Native Communities

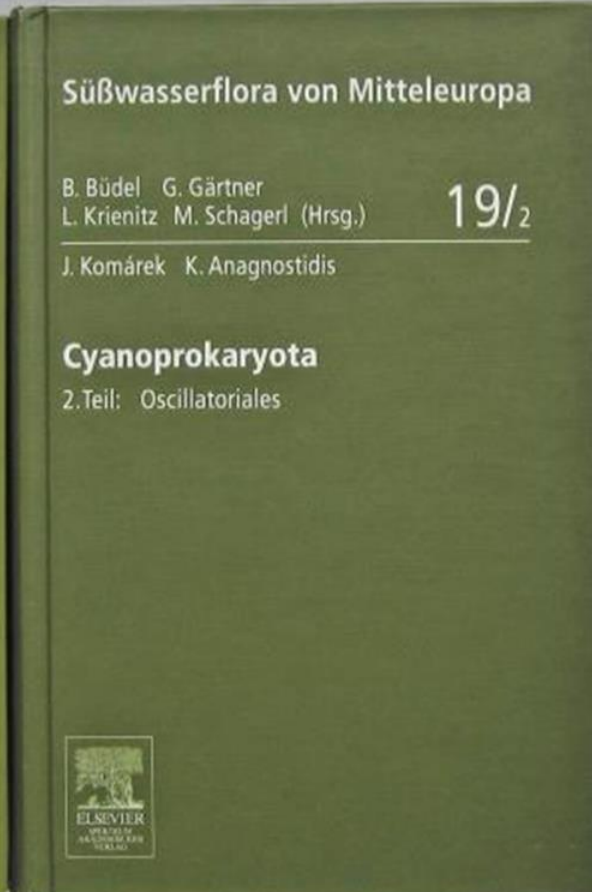
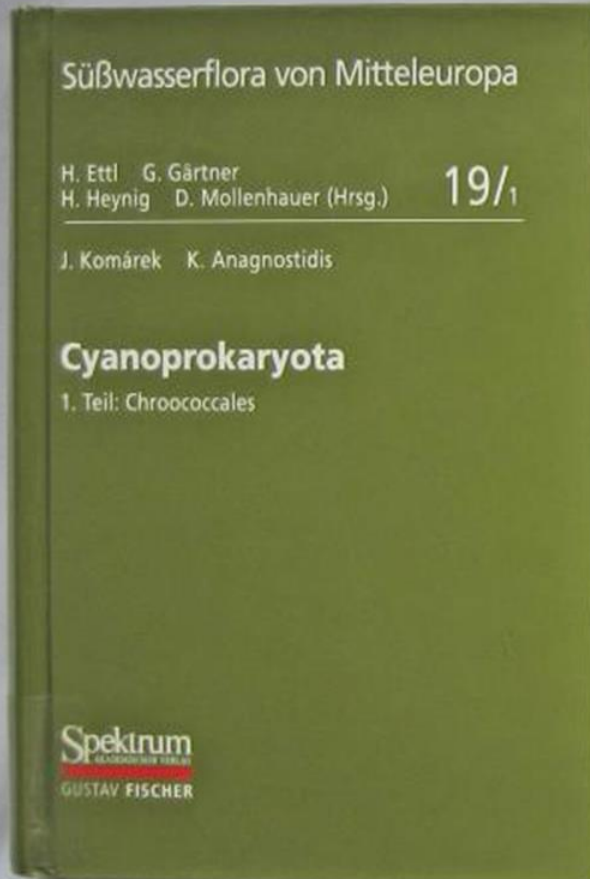


Open-File Report 2015-1164

U.S. Department of the Interior
U.S. Geological Survey

Süßwasserflora von Mitteleuropa: Cyanoprokaryota

Komárek & Anagnostidis 2008-2013



Online Resources



Sinice a řasy.cz - galerie

Přihlásit

English

Galerie

Vyhledat

- Akce
- Chlorophyta
- Chromophyta
- Cryptophyta
- Cyanobacteria
- Dinophyta
- Euglenophyta
- Glaucoophyta
- Haptophyta
- Rhodophyta
- Streptophyta
- vodní bezobratlí
- vodní obratlovci



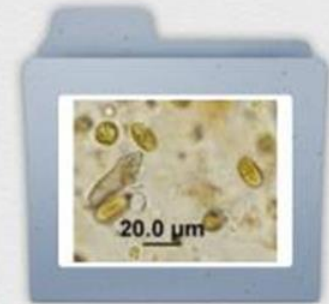
Akce



Chlorophyta



Chromophyta



Cryptophyta



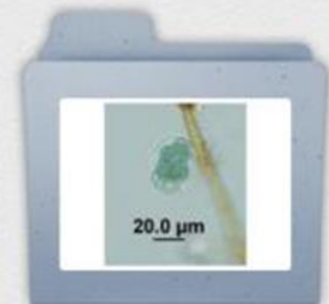
Cyanobacteria



Dinophyta



Euglenophyta



Glaucoophyta



147,755 species and infraspecific names are in the database, 20,156 images, 56,639 bibliographic items, 352,768 distributional records.

Species Search

Search results

For more detail, click on the name or the currently accepted name.

Name	Current accepted name (if different)
Anabaena flosaquae f. lemmermannii (P.G.Richter) Canabaeus	Dolichospermum lemmermannii (Richter) P.Wacklin , L.Hoffmann & J.Komárek
Anabaena lemmermannii f. laxa (Skuja) G.Cronberg & J.Komárek - Unchecked	
Anabaena lemmermannii P.G.Richter	Dolichospermum lemmermannii (Richter) P.Wacklin , L.Hoffmann & J.Komárek
Anabaena lemmermannii var. minor (Utermöhl) Komárková	

4 Found - Displaying 1 through 4

Recent Species

[Anagnostidinema tenue](#)
(Anisimova) [Strunecy et al.](#)

[Anagnostidinema lemmermannii](#)
(Wolozynska) [Strunecy et al.](#)

[Anagnostidinema lacus](#)
-*solaris* (S.E.Campbell & Golubic) [Strunecy et al.](#)

[Anagnostidinema ionicum](#)
(Skuja) [Strunecy et al.](#)

[Anagnostidinema epiphloeophyticum](#)
(Anagnostidis) [Strunecy et al.](#)

[Anagnostidinema exile](#)
(Skuja) [Strunecy et al.](#)

[Anagnostidinema deflexum](#)
(West & G.S. West) [Strunecy et al.](#)

[Anagnostidinema acutissimum](#) (Kufferath) [Strunecy, Bohunická, J.R.Johansen & J.Komárek](#)

[Anagnostidinema amphibium](#) (C.Agardh ex Gomont) [Strunecy, Bohunická, J.R.Johansen & J.Komárek](#)

WI Cyanobacteria Resources


Blue-green algae - YouTube - Windows Internet Explorer

http://www.youtube.com/watch?v=CGG50pfBEH&feature=player_embedded

File Edit View Favorites Tools Help

Favorites Suggested Sites (2) Suggested Sites

Blue-green algae - YouTube



Blue-green algae

WIDNRTV · 176 videos

6,371

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Blue-Green Algae


Harmful Algal Blooms Home	Understanding Algae	Health Concerns	Keeping Our Lakes Clean	Images of Algal Blooms	Resources and Links	Contact Us
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Wisconsin's Harmful Algal Blooms Program

Wisconsin's Harmful Algal Blooms program collects information about human and animal illness and death resulting from exposure to blue-green algae. Tracking illness information will help the Wisconsin Division of Public Health measure the problem of blue-green algae in our lakes and rivers.

If you get sick after swimming in a Wisconsin lake or river, please [report possible algae-related illness](#). This program does not provide medical treatment, so if you are experiencing severe symptoms seek medical attention immediately.

When in doubt, best keep out!

			
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[Back to Environmental Health Resources](#)

Last revised: March 03, 2011

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Protecting and promoting the health and safety of the people of Wisconsin
The Official Internet site of the Wisconsin Department of Health Services

dnr.wi.gov and dhs.wisconsin.gov
Search for "algae"

Microscopes

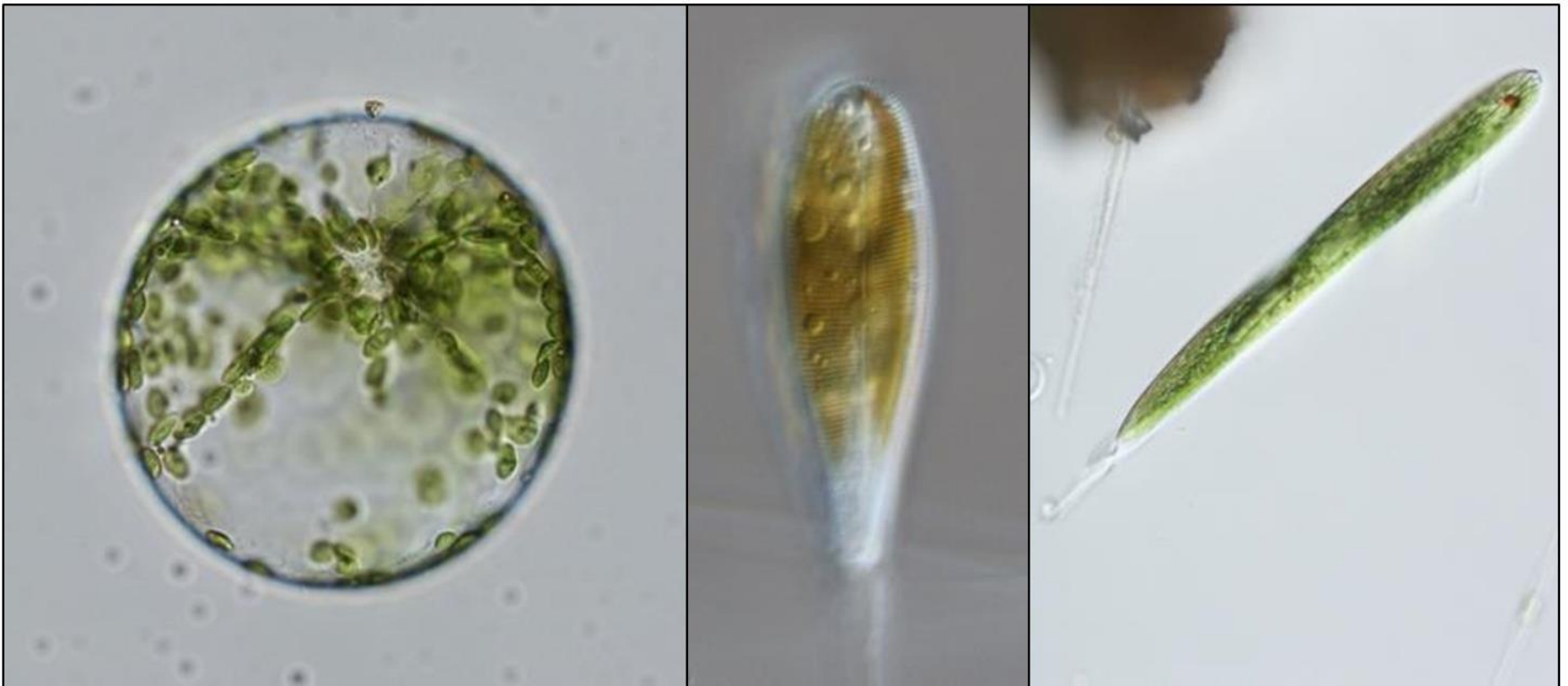


Caveats

- Introduction to cyanobacteria
- Tools to ID cyanobacteria *vs.* other algae
- Resources for accurate communication

What are algae?

- Have chlorophyll, like plants
- Lack specialized tissues, unlike plants
- They grow everywhere, even in deserts
- From tiny unicells to giant kelp



Species vs. Strains

- Cyanobacteria (blue-green algae) are true bacteria
- Bacteria only divide – no sexual reproduction
- Different genetic makeups can evolve – these are strains.

Key features for identification

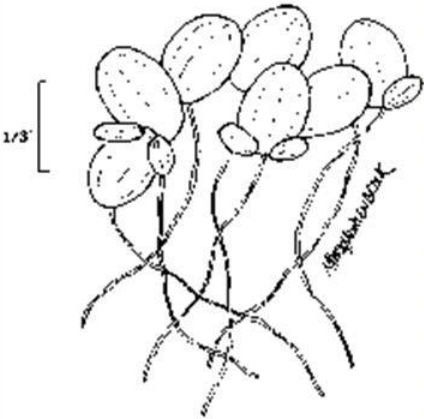
- Color. All algae have chlorophyll-a. Many have additional pigments.
- Texture: stringy and hair-like? Tiny particles in water? Does it drape over your fingers or run right through them?
- Shape of colonies
- In most cases, light microscopy is necessary.

Look for tiny green specks in
water or green “dust” on surface



Don't mistake duckweeds or watermeal for blue-green algae

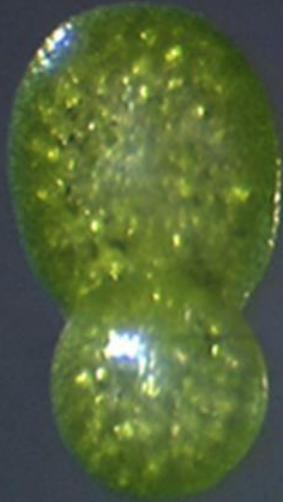
Duckweeds (*Lemna*, *Spirodela*) have roots



Lemna, *Spirodela*, *Wolffia*



Watermeal (*Wolffia*)
Tiny, firm, grainy

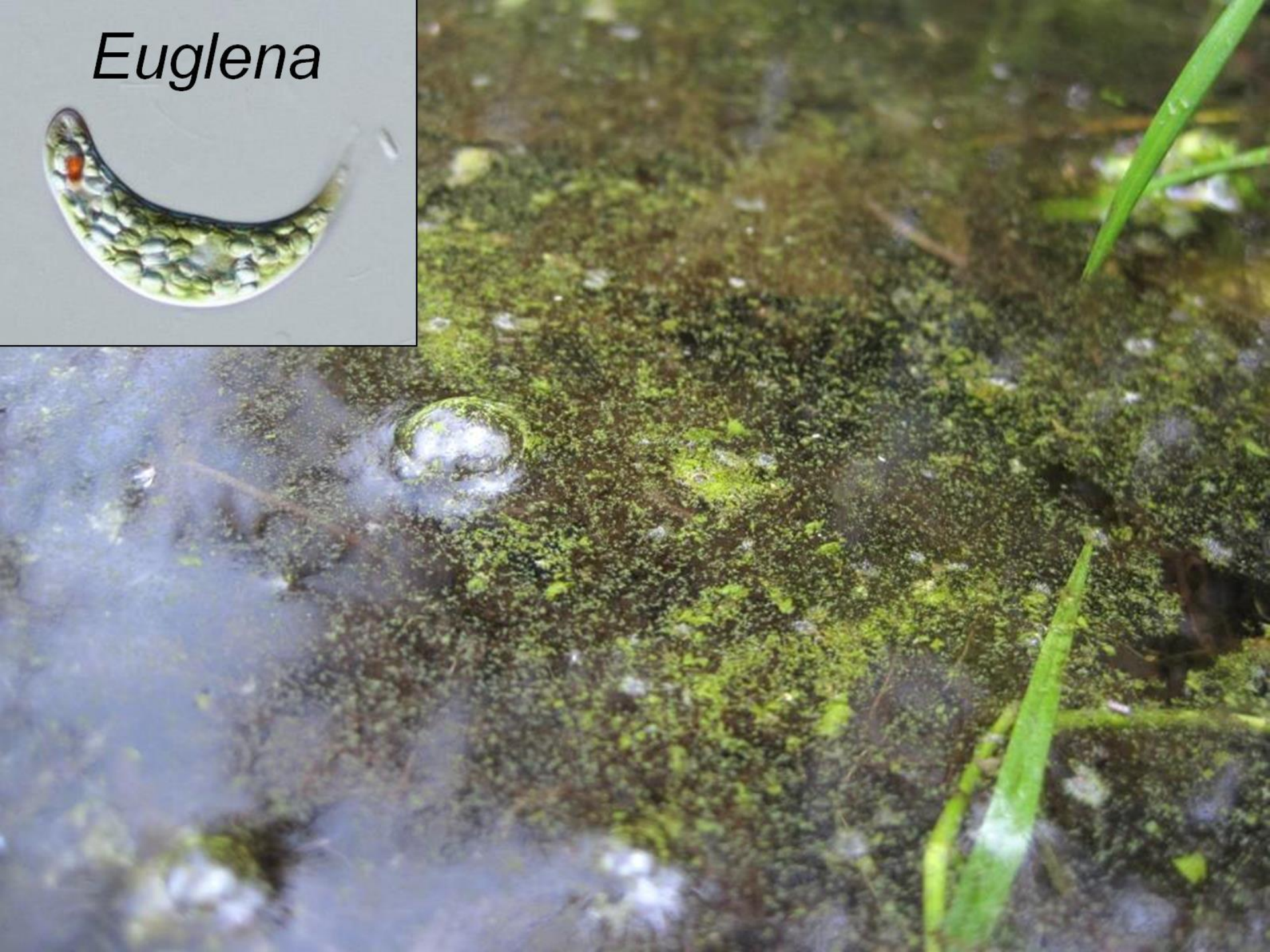


Don't mistake yellow pollen for blue-green algae



Look for similar yellow "dust" on land

Euglena



Duckweed

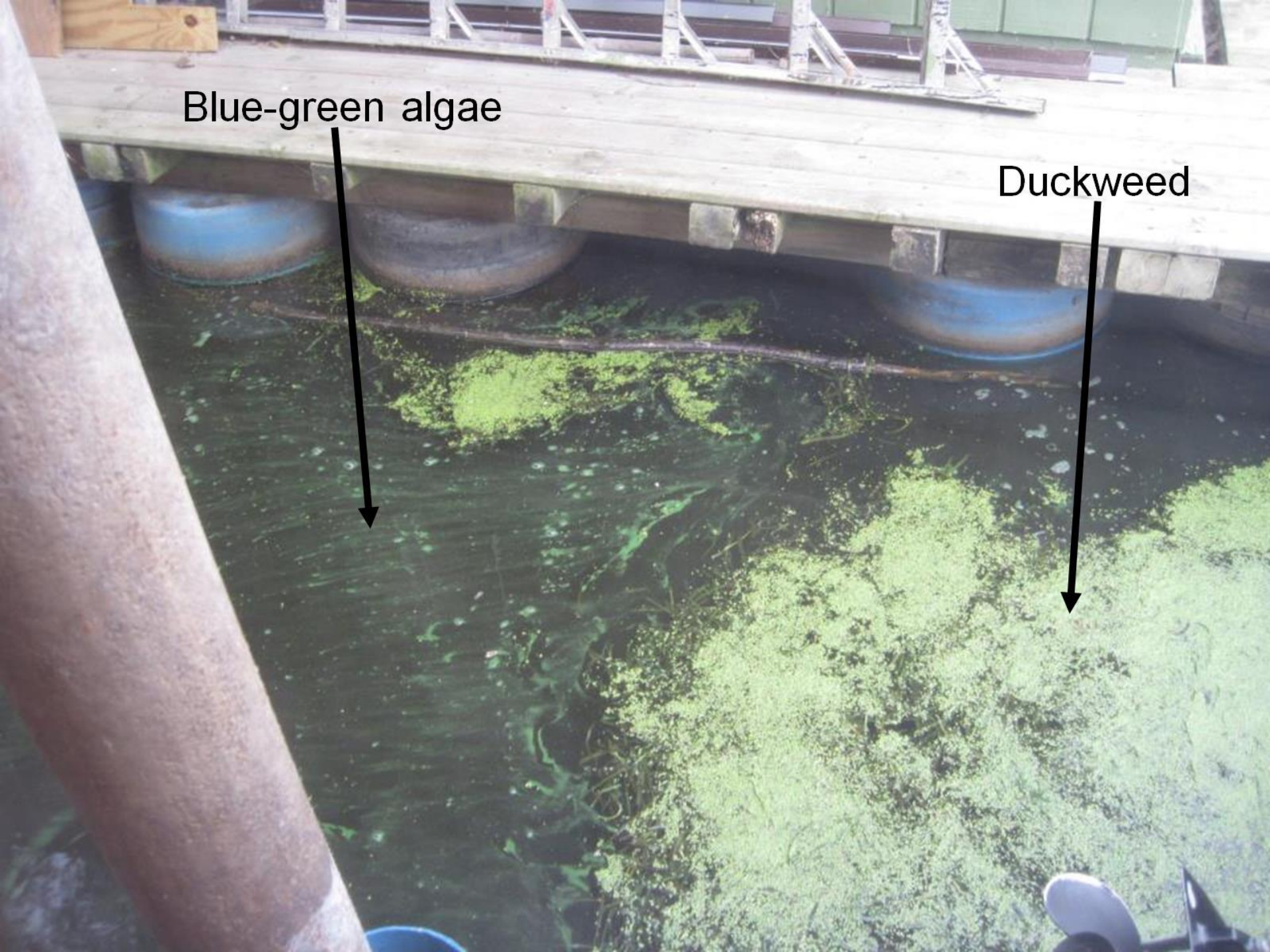


Blue-green algae



Blue-green algae

Duckweed





Don't mistake filamentous green algae for blue-green algae

Spirogyra & relatives

slippery texture, hairlike, unbranched



Cladophora & relatives

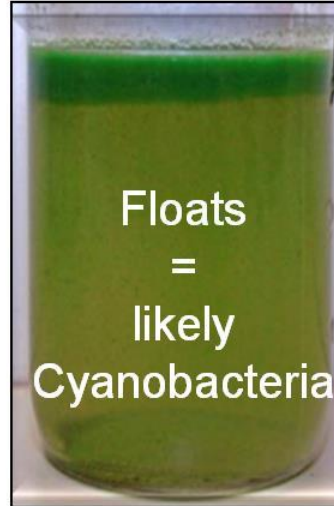
wet cotton texture, usually branching



S. Pfeiffer

Jar test vs. stick test

Fine green particles
collected from just below
the surface

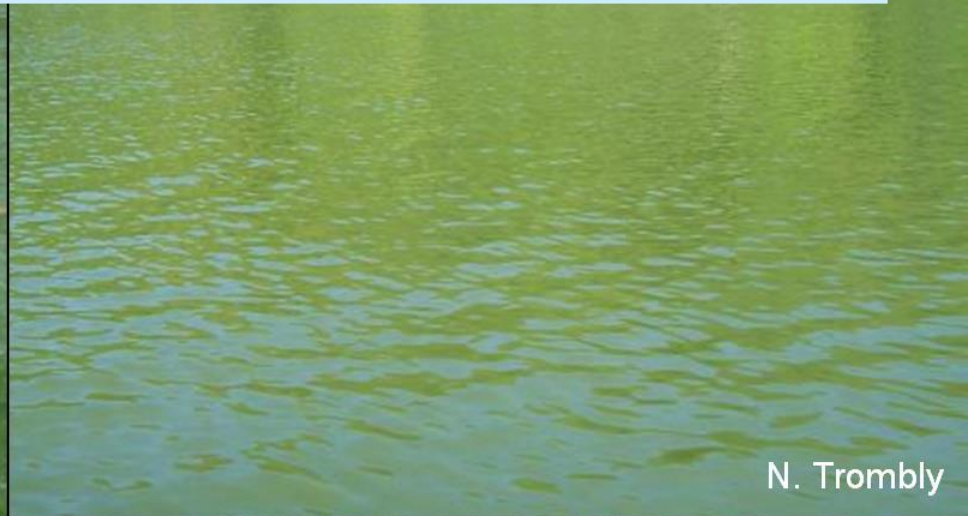




“Blue-green” is misleading



J. Williamson



N. Trombly



S. Greb



E. Heath

Growing blooms are most often green in color.

growing

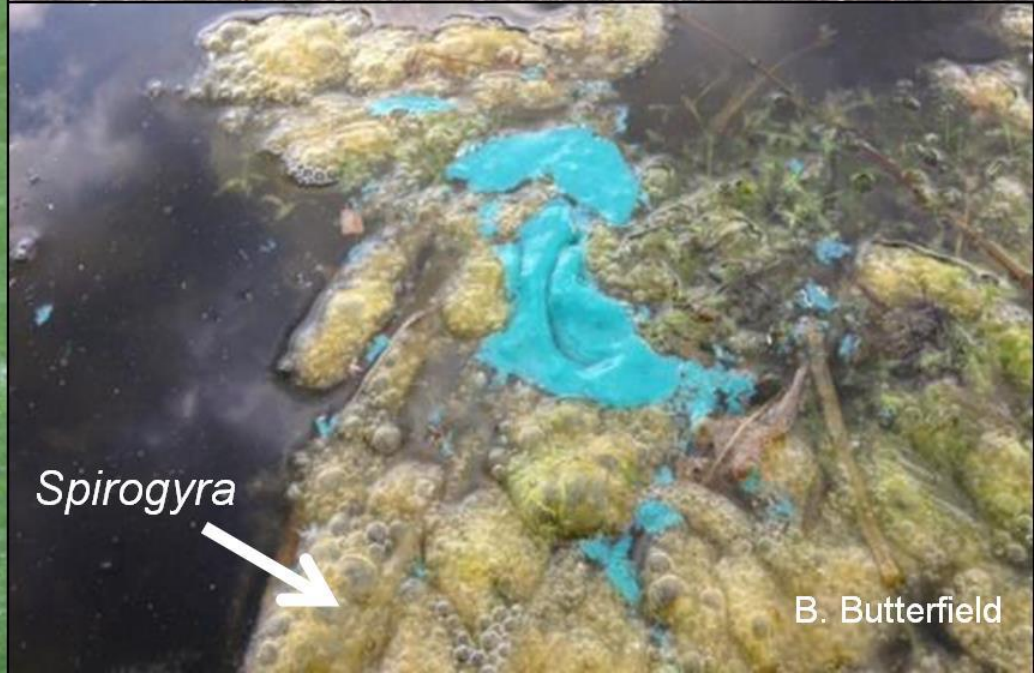


J. Williamson

decomposing
pigments are released



M. Meade



Spirogyra



B. Butterfield





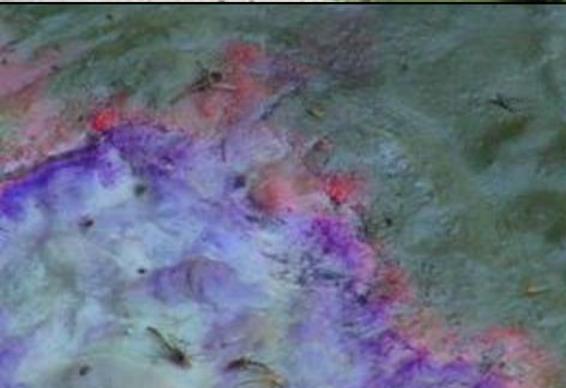
R. McLennan



N. Trombly



T. Moris



R. McLennan



J. Williamson



WDHS



J. Williamson

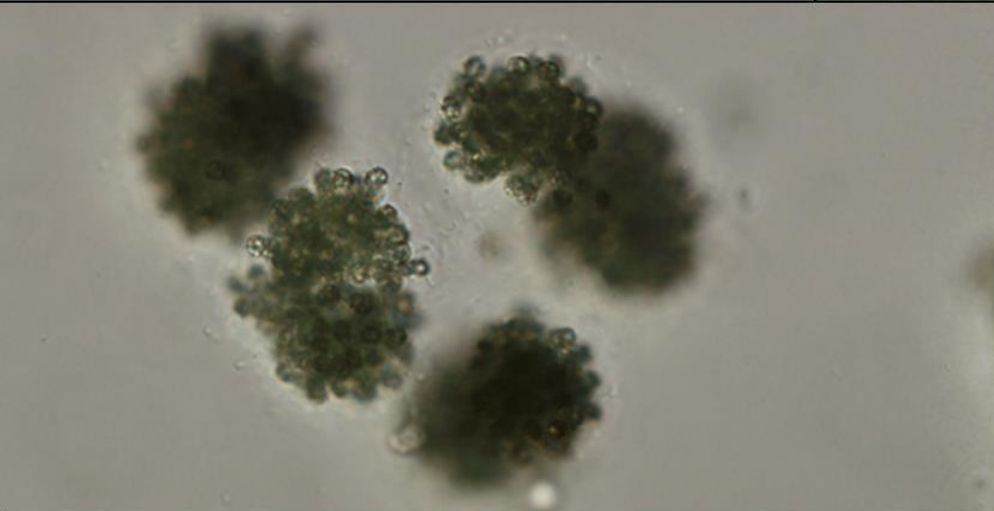
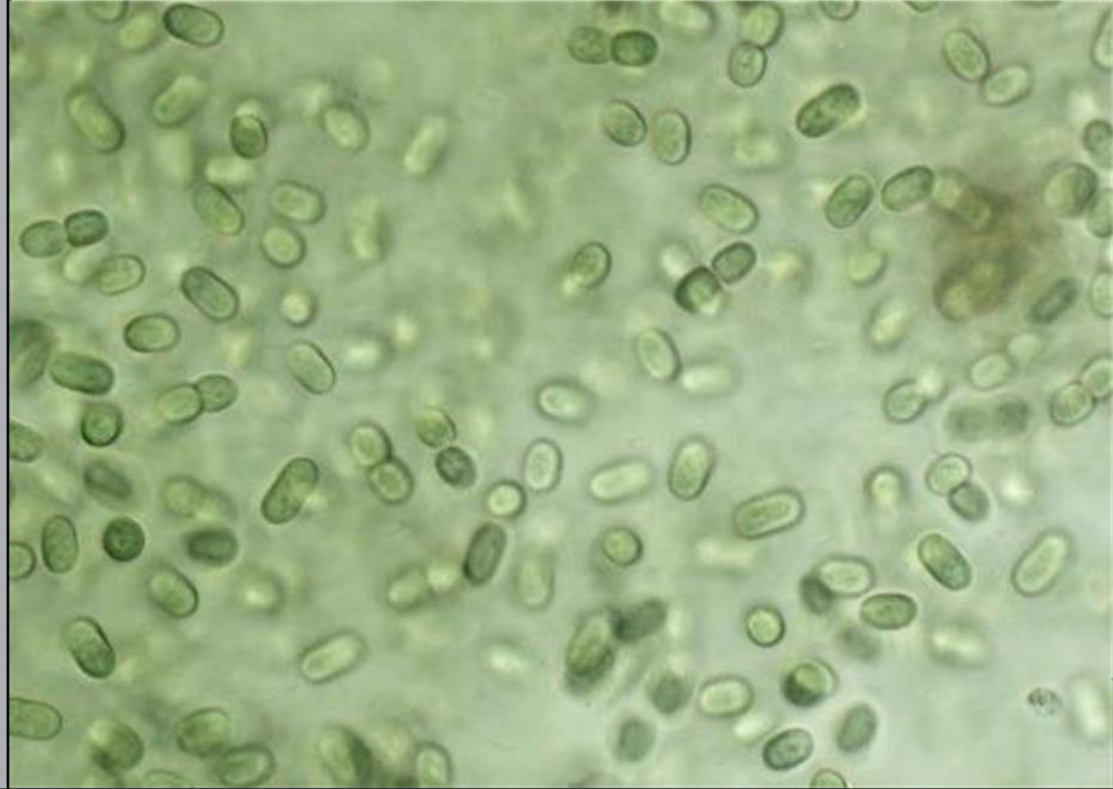


A. Dryja

Orders of Cyanobacteria

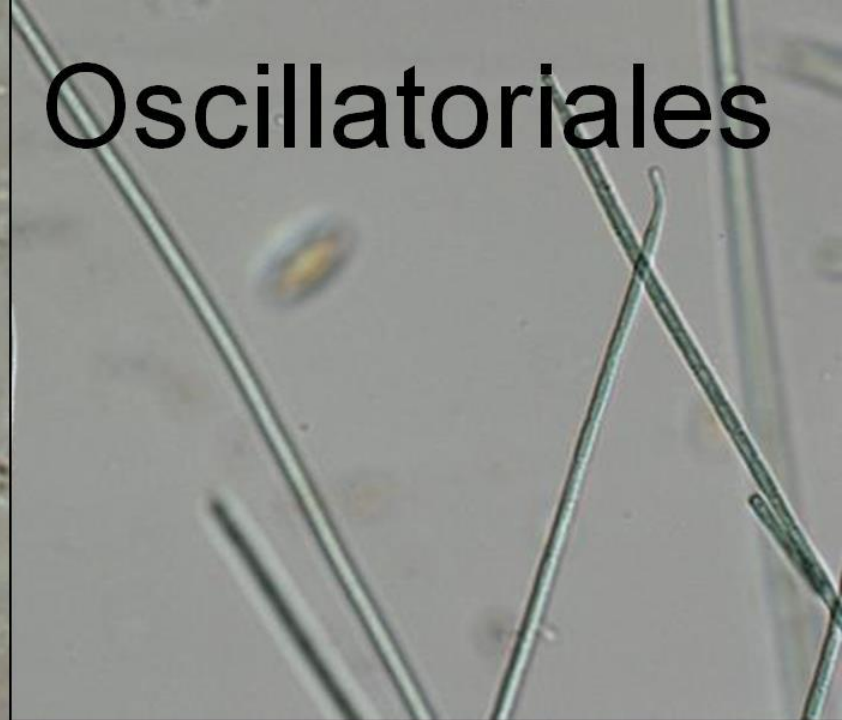
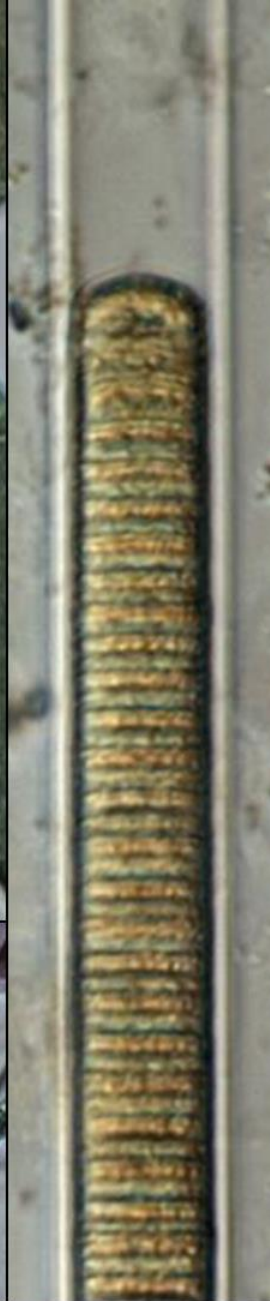


Chroococcales



Single cells or colonies of (mostly) spherical or ovoid cells

Oscillatoriales



Uniseriate, unbranched trichomes (filaments)

Nostocales



Heterocysts for N_2 fixation, false branching, uniseriate

Stigonematales



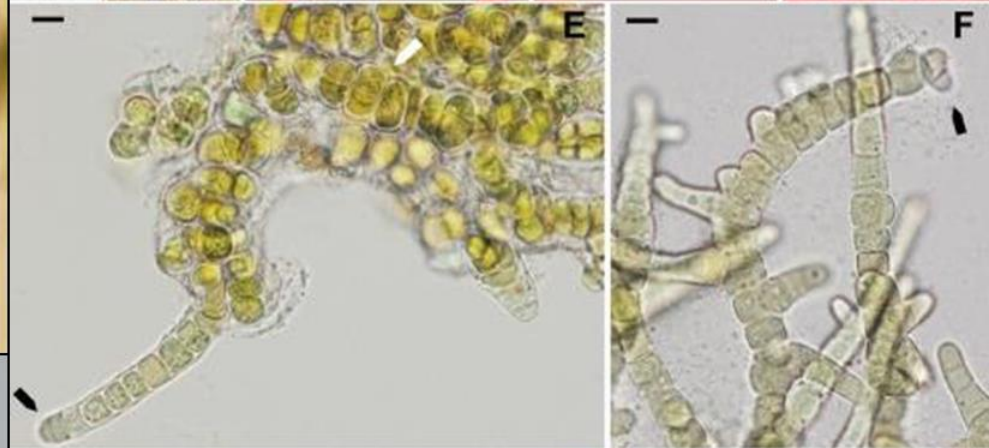
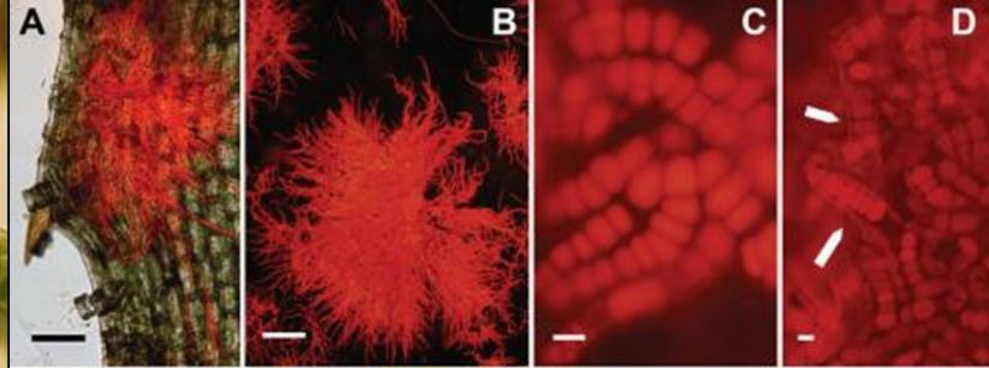
SINICE
& RASY.cz

J. Kaštovský

50.0 µm

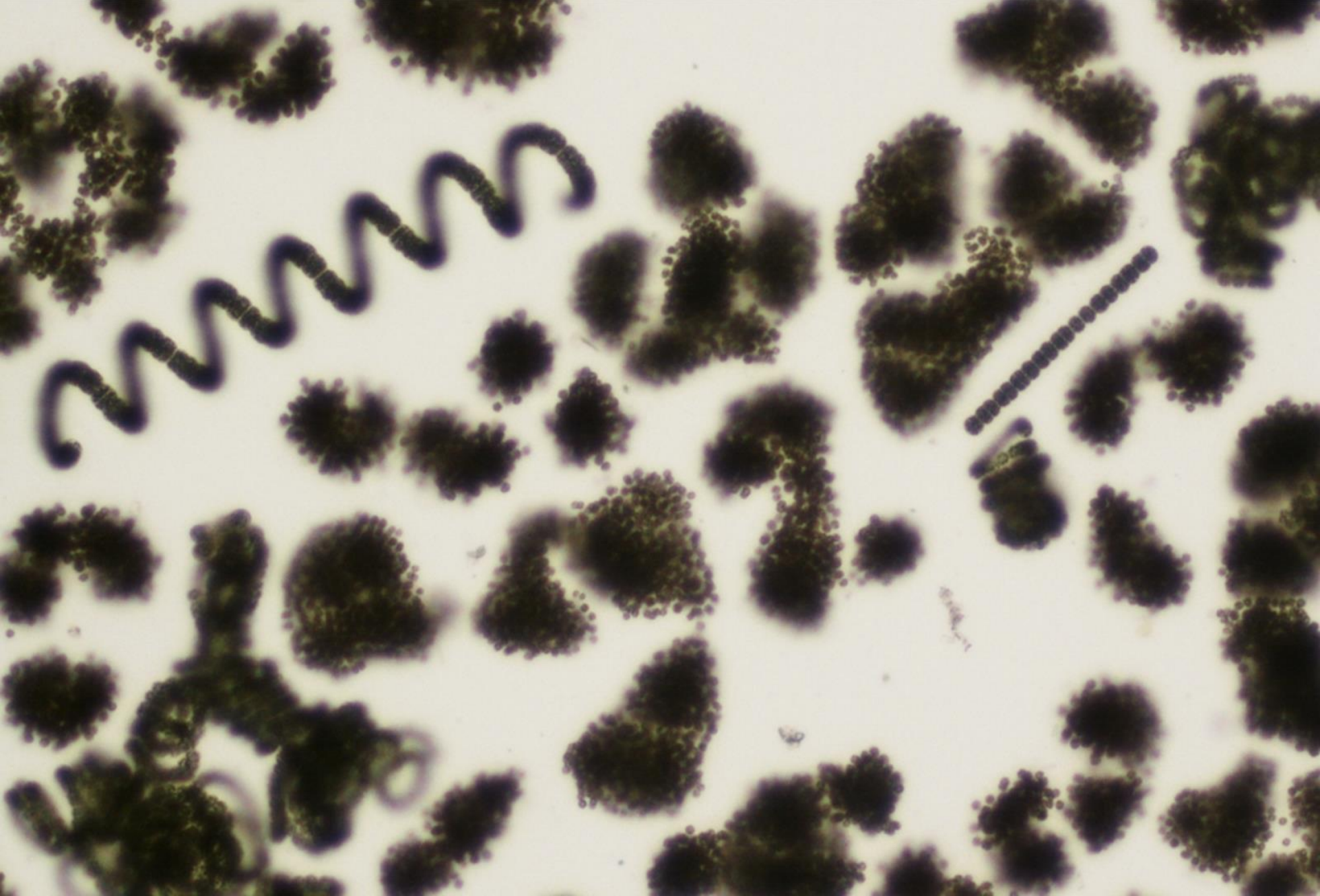


Heterocytes for N₂ fixation,
true branching, multiseriate



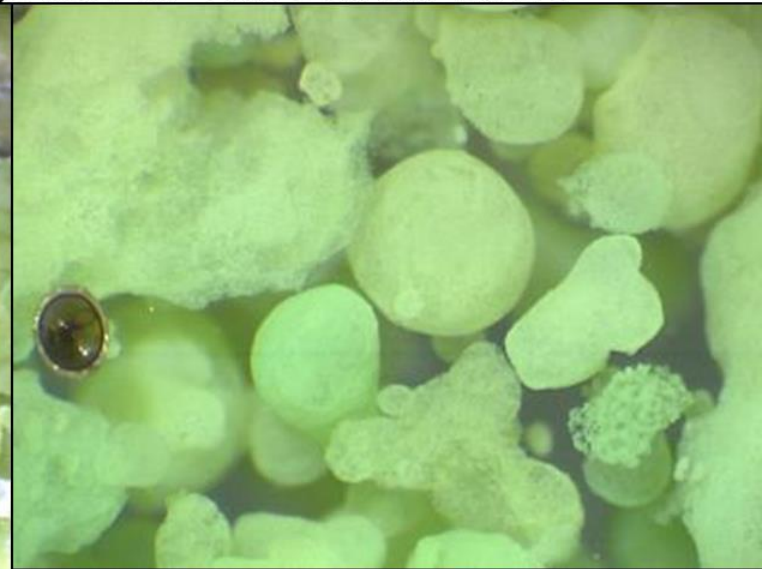
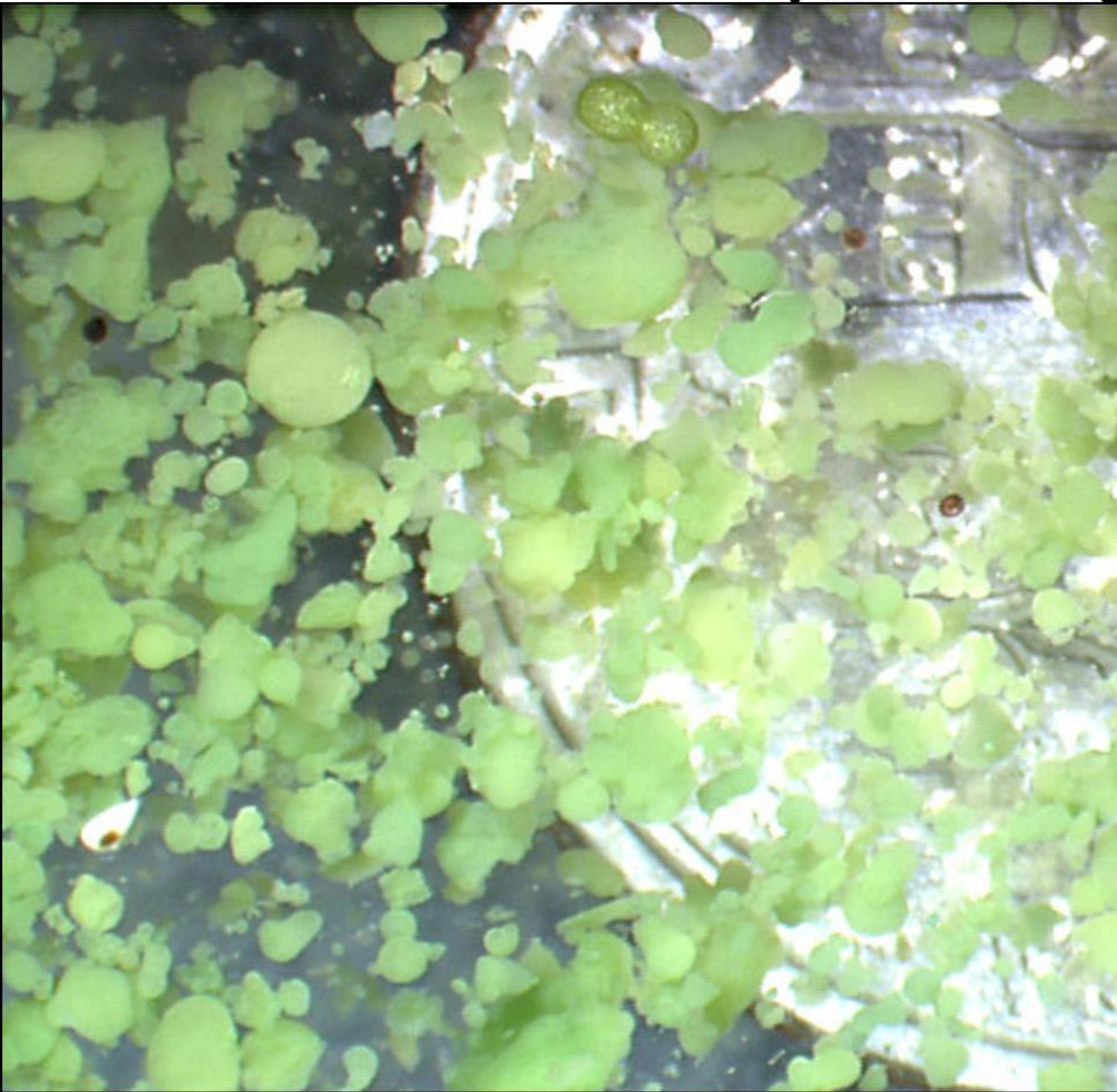
Aetokthonos hydrillicola
Eagle-killer *Hydrilla* dweller
Wilde et al. 2014 *Phytotaxa* 181:243-260

PLANKTONIC BLOOMS: *Microcystis* and other buoyant species appear black when viewed with a microscope, due to light refraction by the gas vesicles in the cells.



Microcystis

The most common bloom-forming cyanobacteria genus in Wisconsin lakes

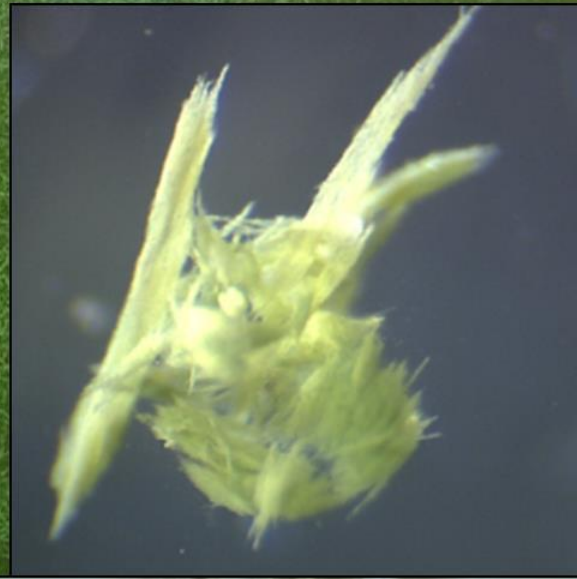


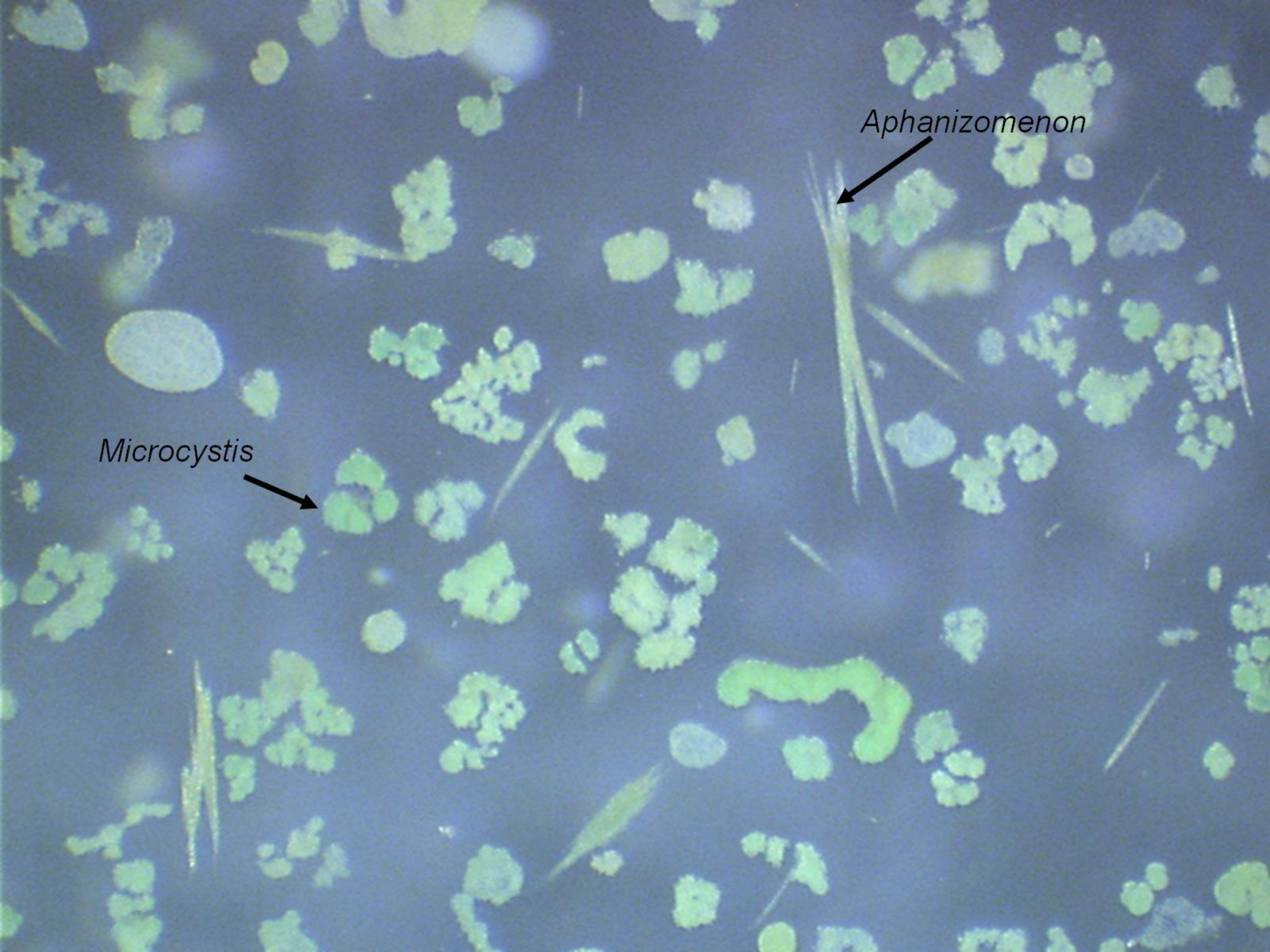


Aphanizomenon

Tiny grass clippings

C. Carlson





Aphanizomenon

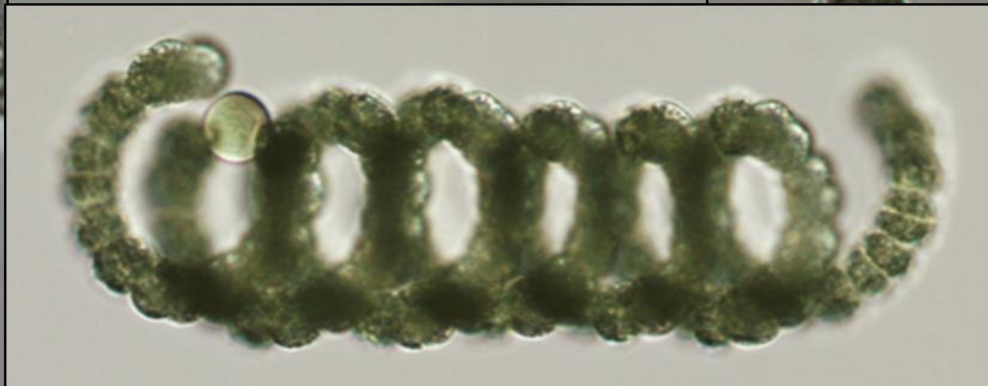
Microcystis

Anabaena

Anabaena & *Dolichospermum*

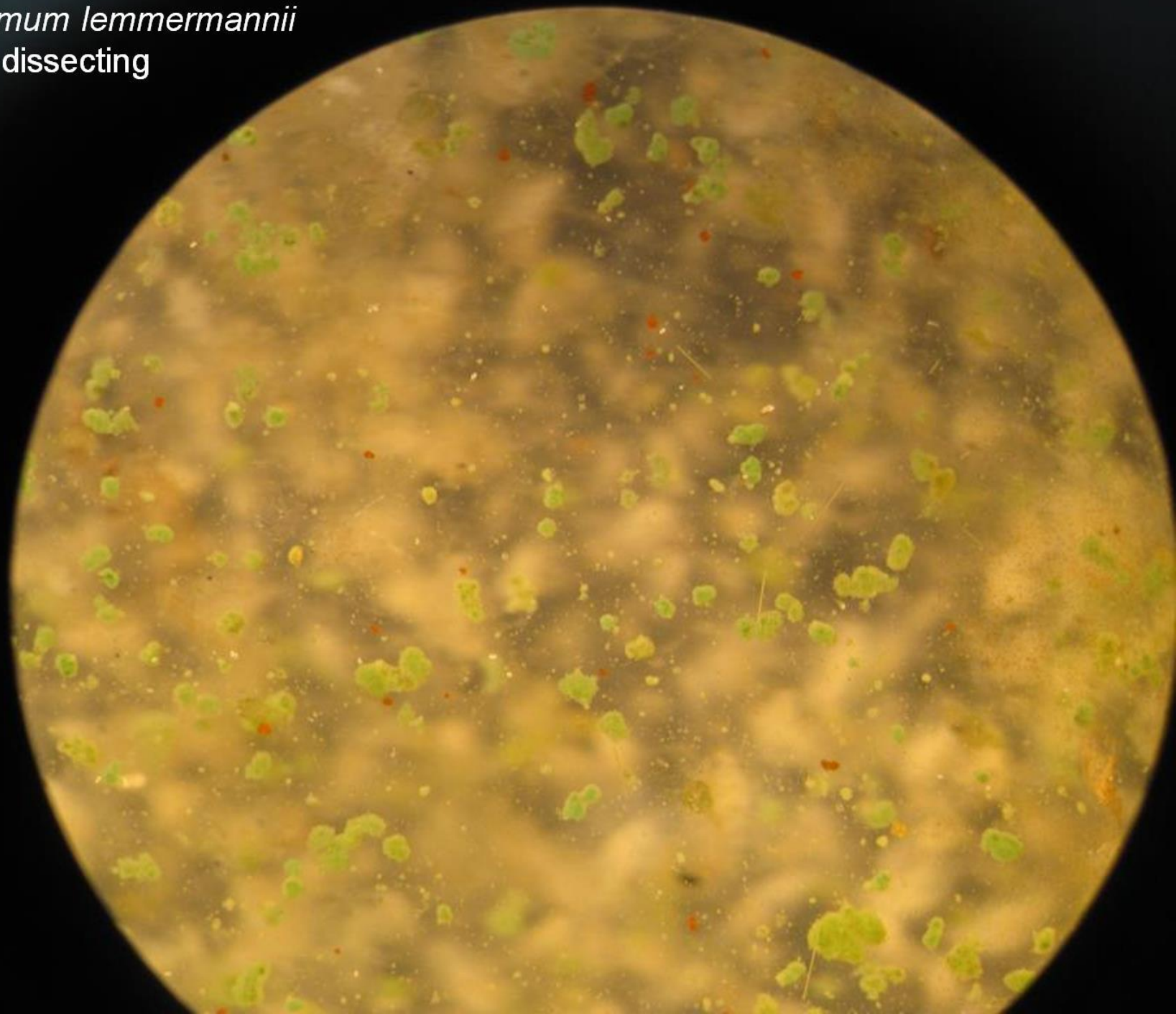
(no aerotopes)

(with aerotopes)

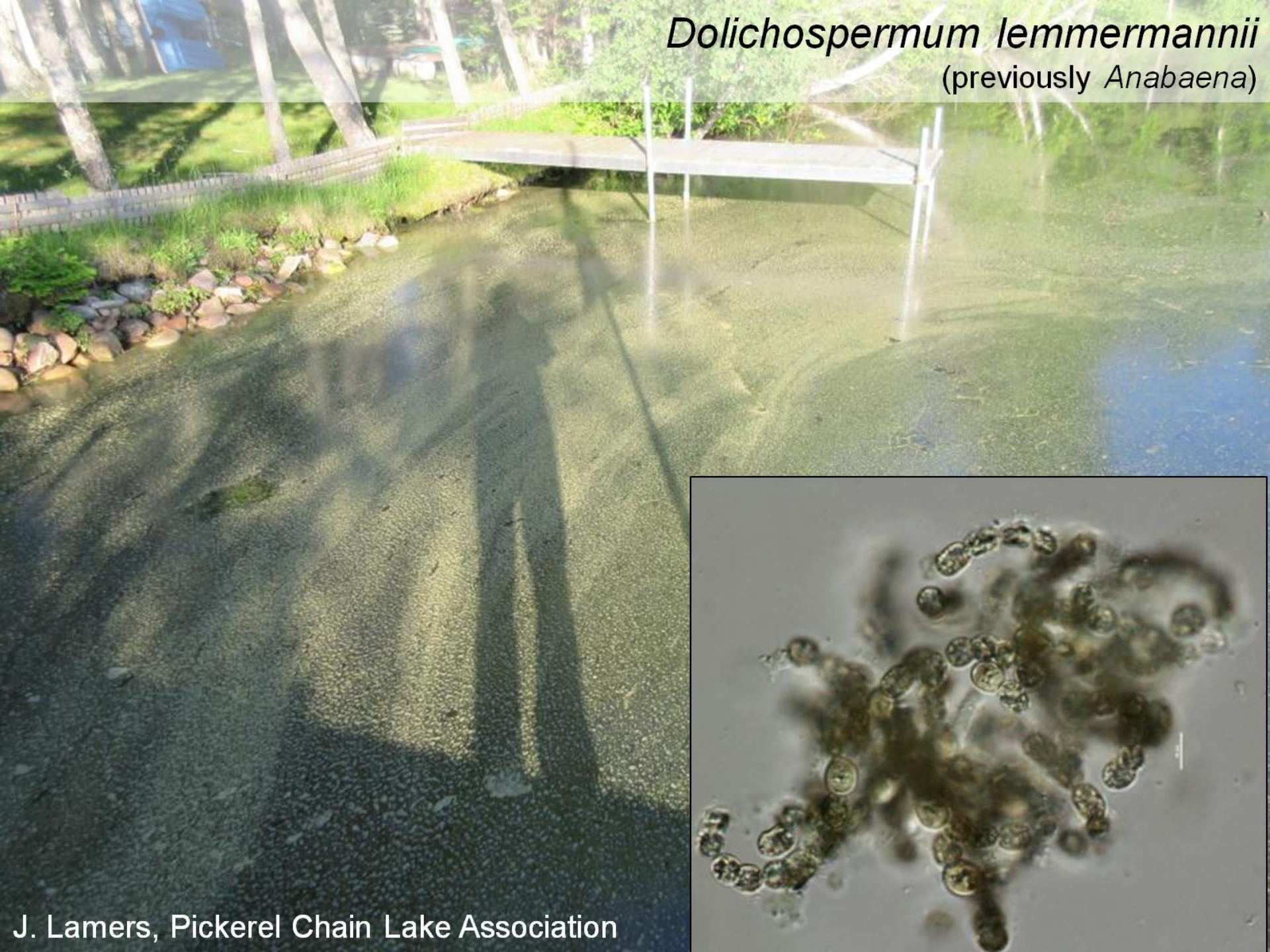




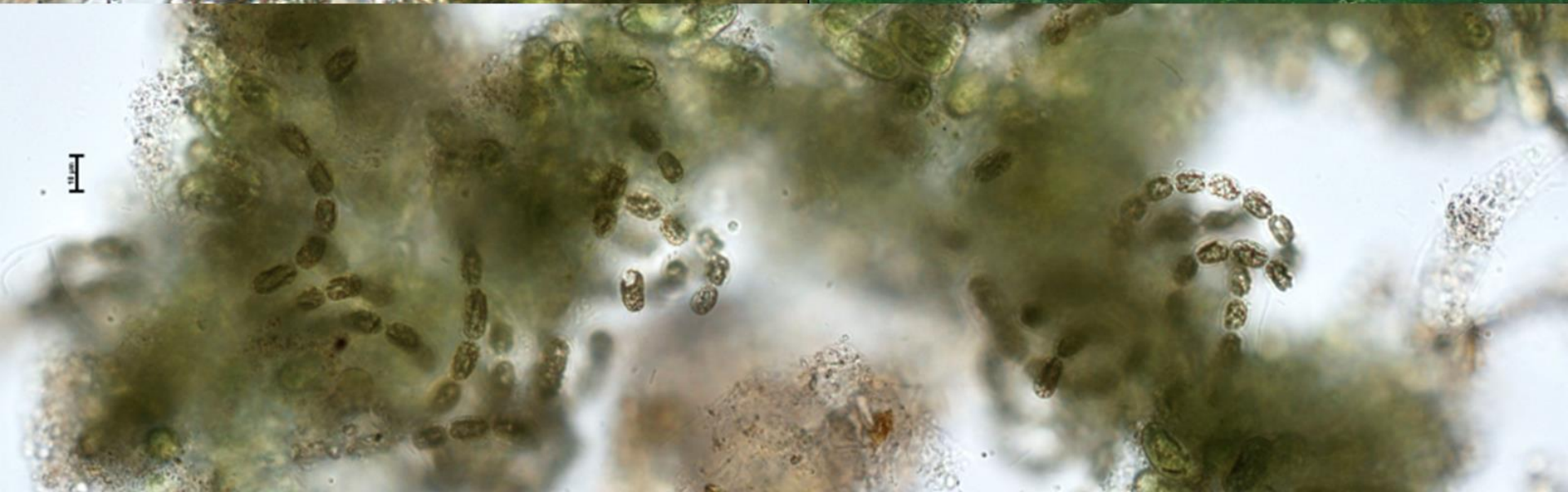
Dolichospermum lemmermannii
viewed with dissecting
microscope



Dolichospermum lemmermannii
(previously *Anabaena*)



Dolichospermum lemmermannii bloom
Lake Superior July 2012



Dolichospermum lemmermannii
Sea caves, Apostle Islands National Lakeshore



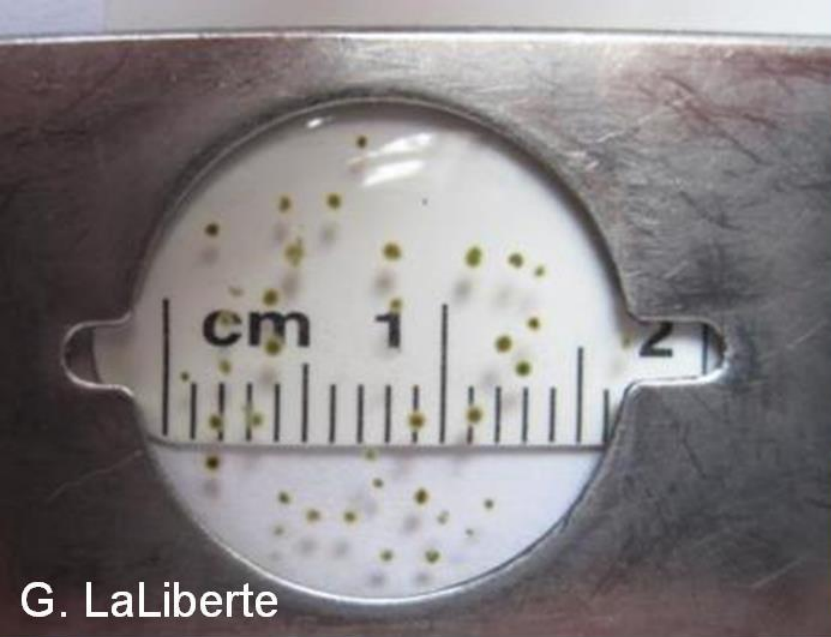
Gloeotrichia echinulata

Not usually associated with toxic bloom events, although some populations have been shown to produce microcystin at low levels.
Blooms may be increasing, even in low-nutrient lakes.
Resting cells overwinter in lake sediments.

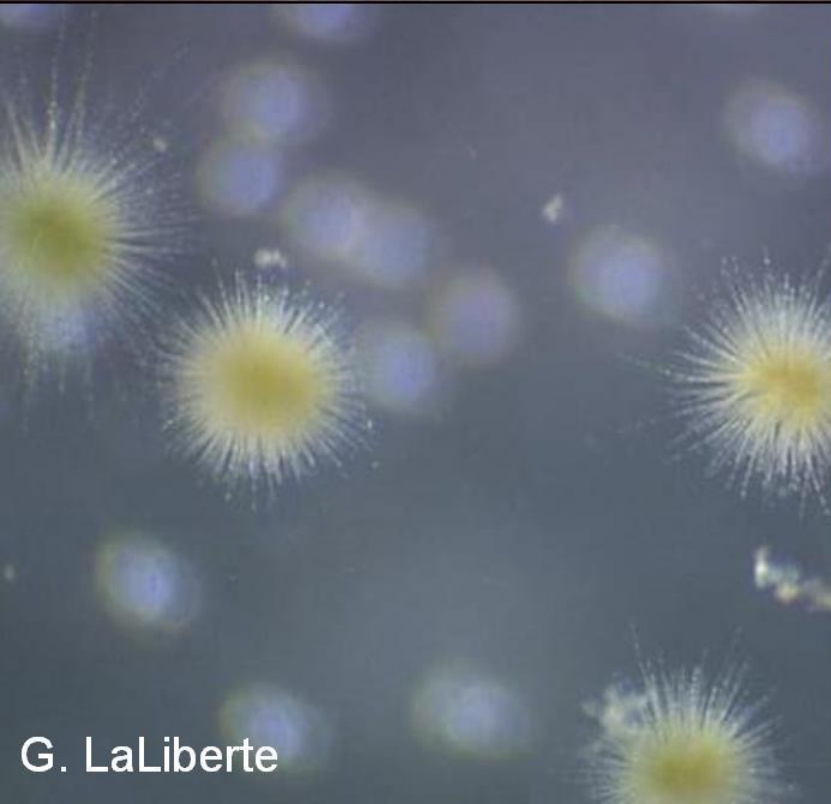


Dense *Gloeotrichia* colonies

J. Williamson, Polk County Land & Water Resources Department



G. LaLiberte

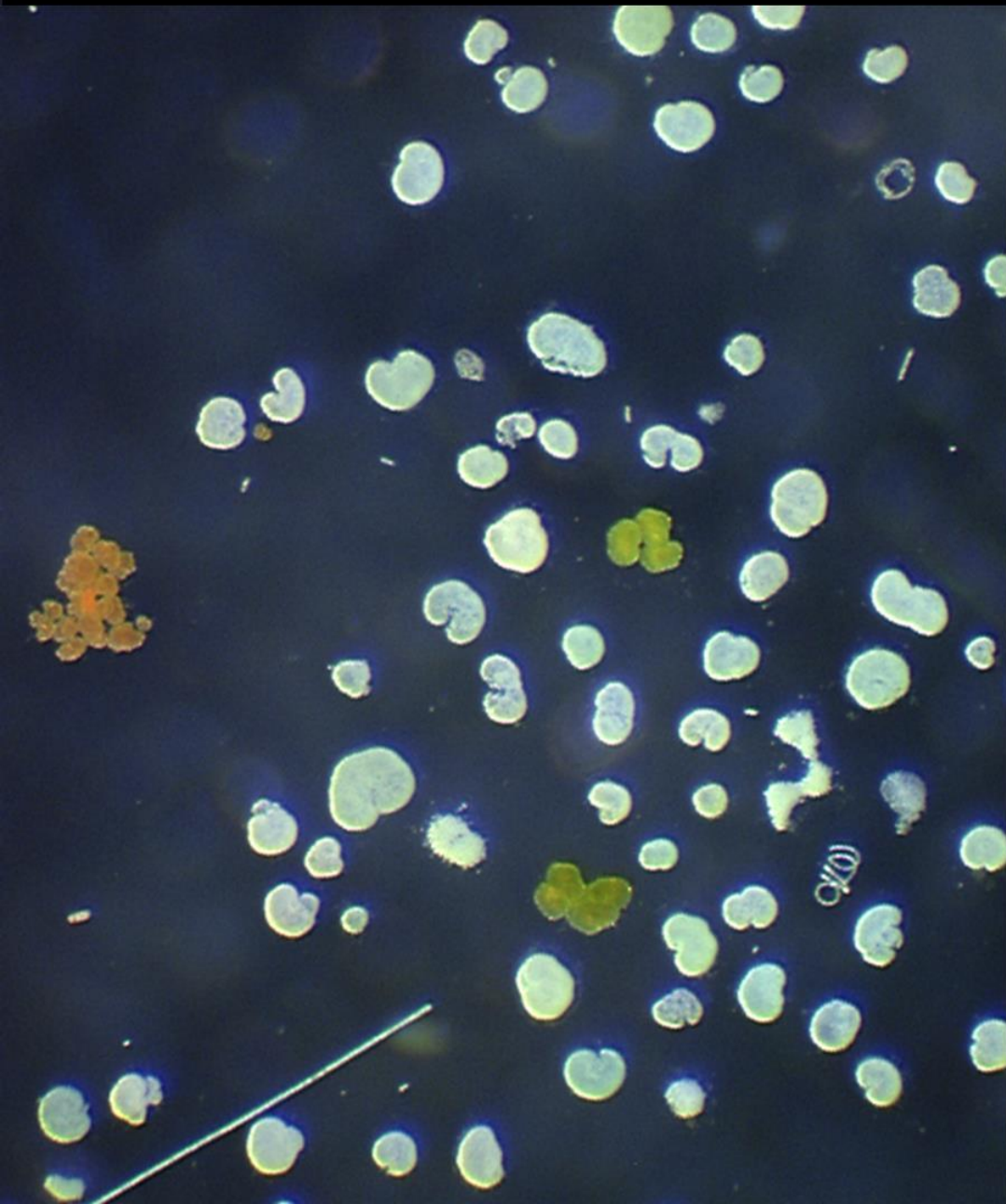


G. LaLiberte



Gloeotrichia echinulata
Clean Lakes Alliance Monitoring Volunteer

Woronichinia
(formerly *Coelosphaerium*)



Cylindrospermopsis raciborskii



Blooms may occur at depth

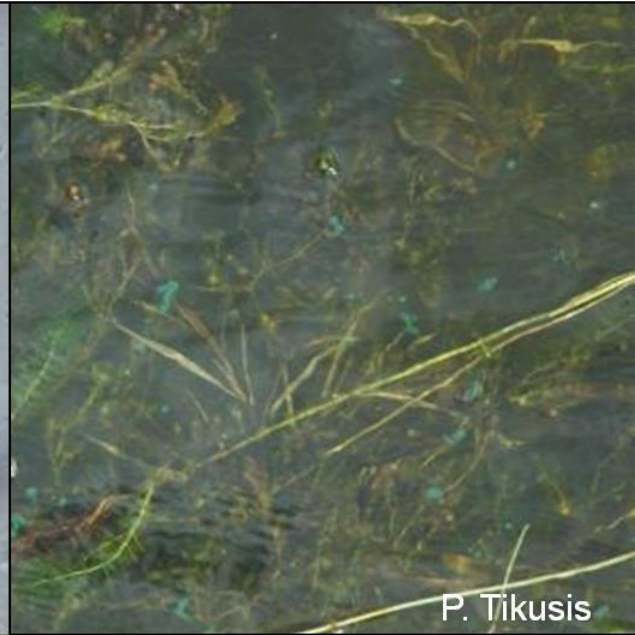
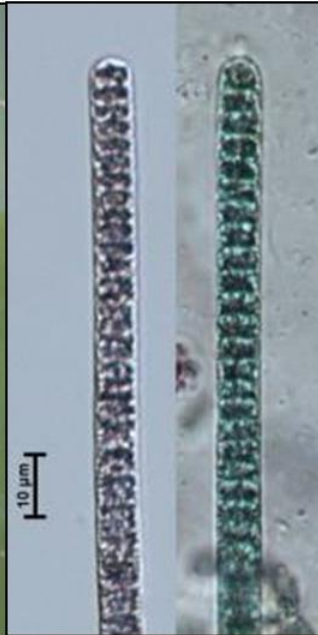
NR40 Prohibited species; subtropical but expanding its range in temperate regions

Floating Benthic Algal Mats:

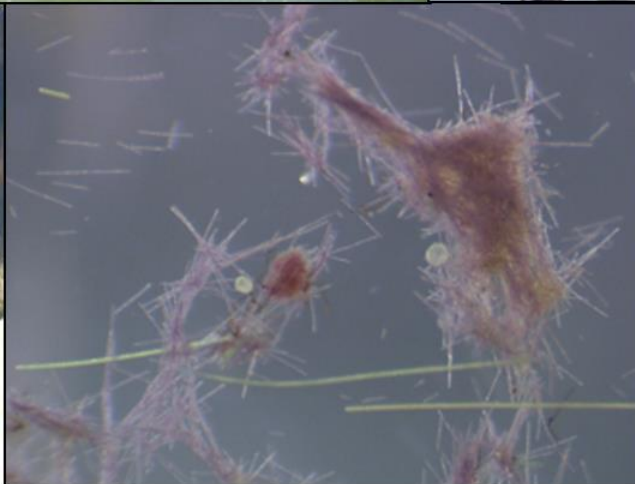
Oscillatoria, *Lyngbya*, *Plectonema*, *Planktothrix*



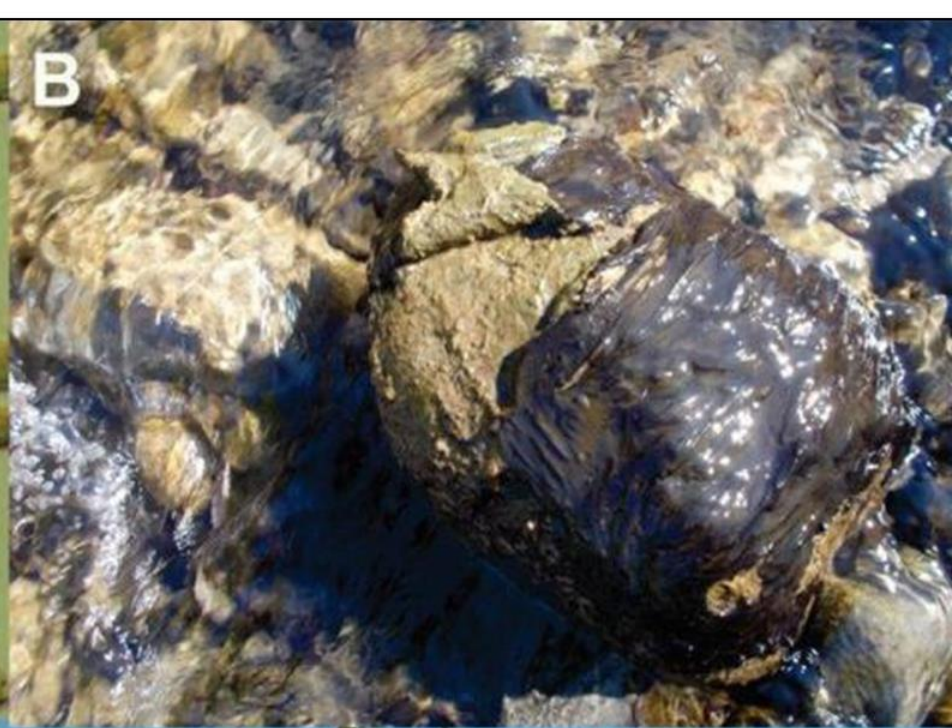
J. Masterson



P. Tikusis



P. Tikusis





Oscillatoria princeps mats

E. Evensen

Cyanobacterial mat material received for identification



Filaments are more evident in water.
These filaments are very long for cyanobacteria – up to 10 mm.

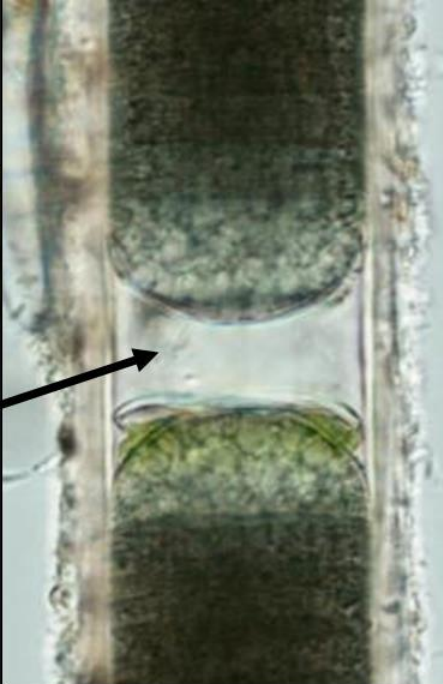
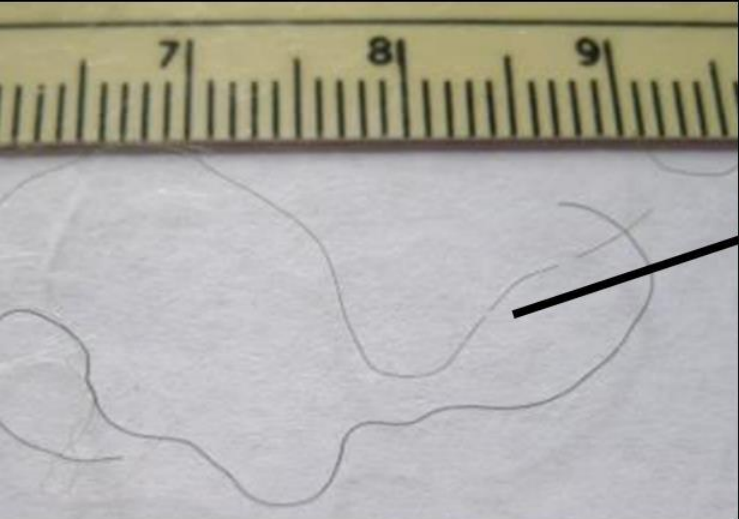




Oscillatoria princeps filaments
under the microscope

G. LaLiberte

Microseira wollei
(formerly *Lyngbya*, *Plectonema*)



Up to several cm long - huge for a cyanobacterium.
"Breaks" are gaps between trichomes inside sheath.



R. Clements



False branching
may occur

Microseira wollei
forming balls in Lake Erie

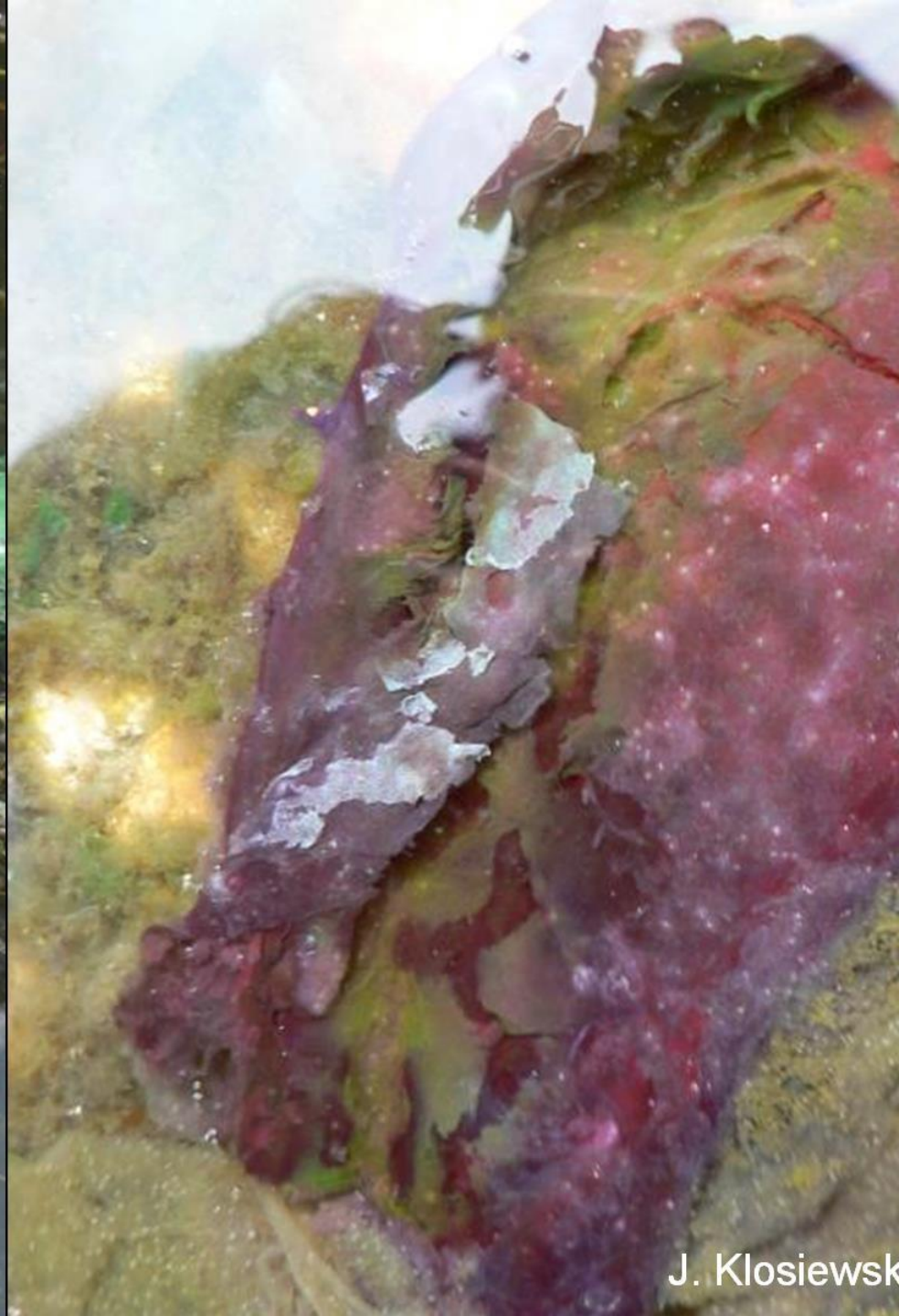






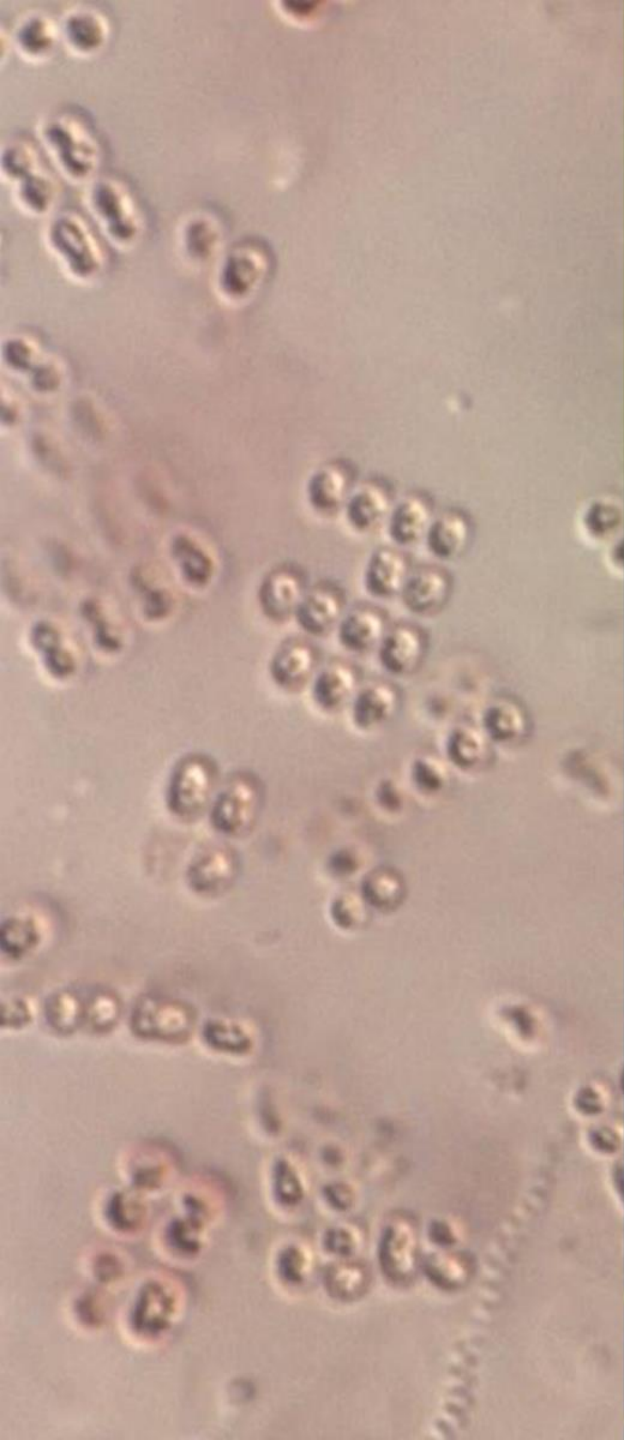


D. Daulton



J. Klosiewsk

Possible look-alike: purple sulfur bacteria. If material is very finely granular, use a microscope to confirm identity.



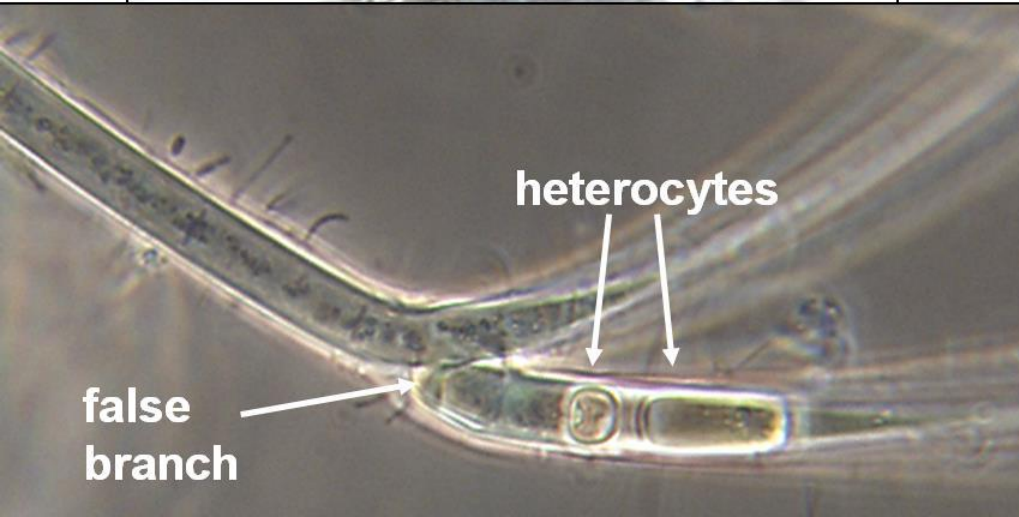
Tolypothrix

Can form balls on lake bottoms that later float to surface

Microscope needed for identification

False branching; heterocyte at branch

Olive-green to brown color







D. Blumer

Aphanothece & *Aphanocapsa*

Colonies consist of small spherical or ovoid cells

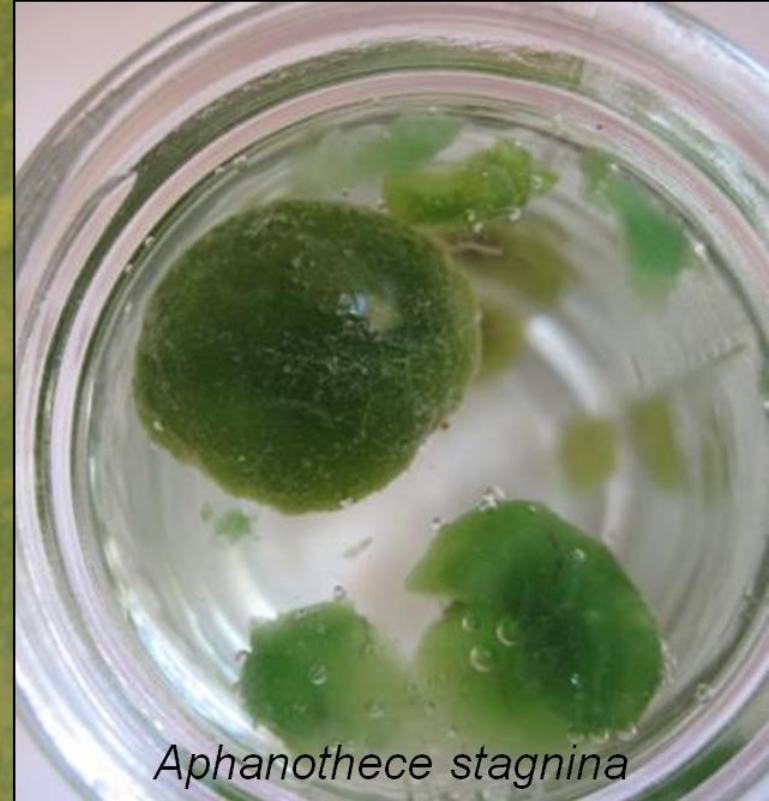
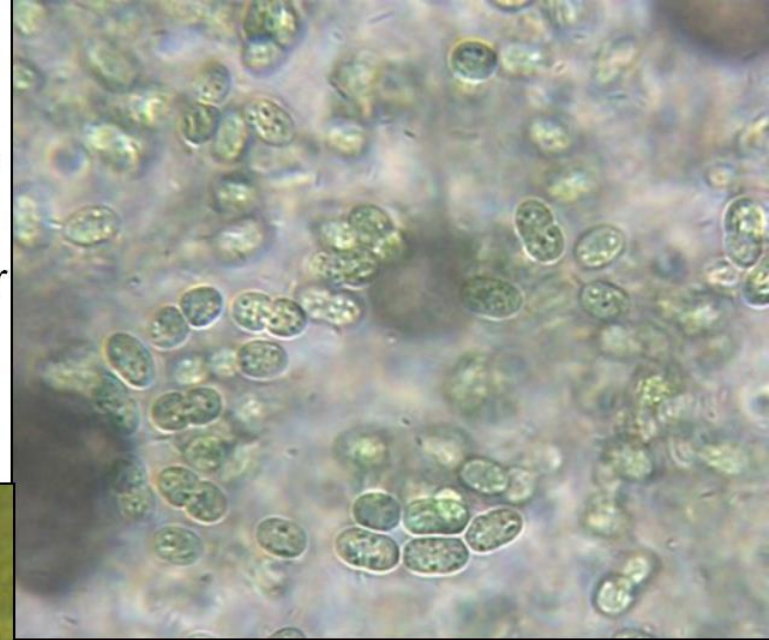
Difficult to identify to species – microscope necessary

Aphanothece stagnina:

Globular or irregular colonies up to a few cm diameter

May form large masses on lake beds, or float

May contain calcite crystals





Nostoc

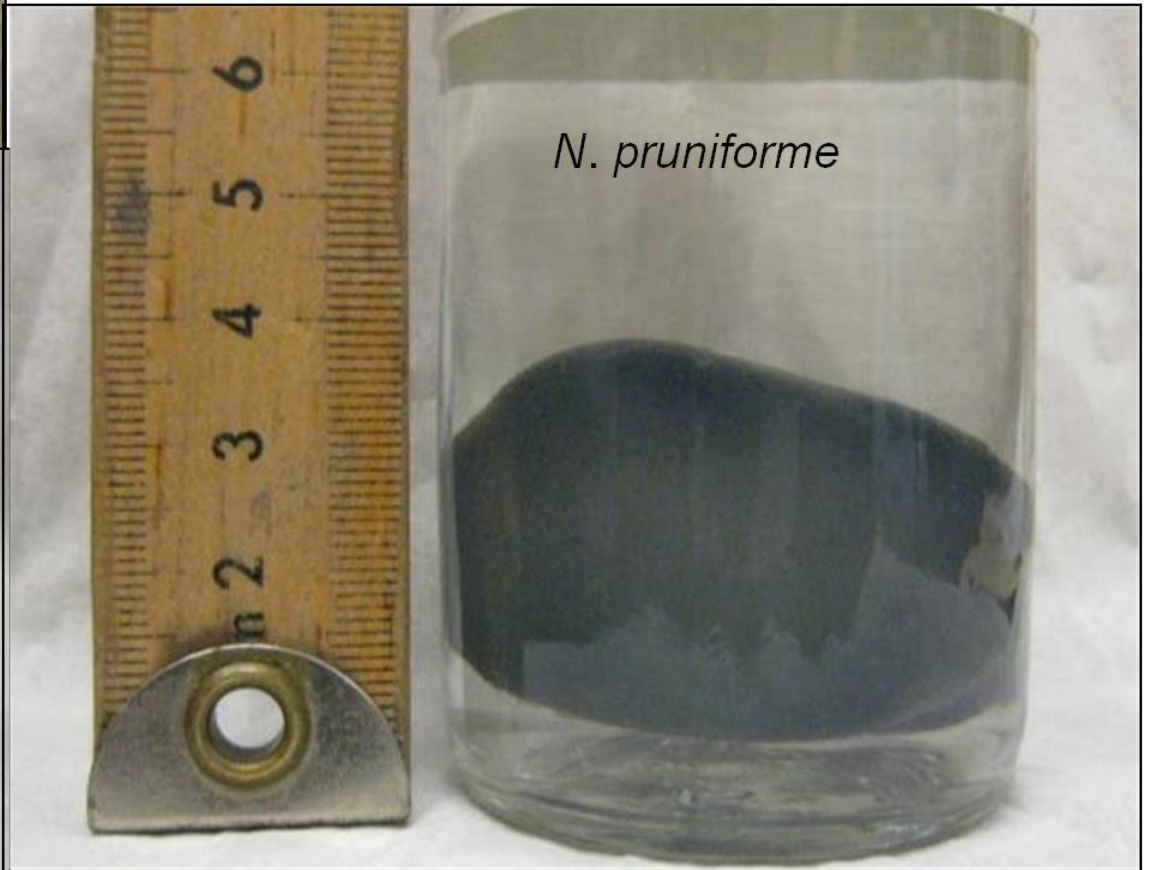
Aquatic species: pinhead to egg-size, on lake bottom or floating

N. pruniforme: “lake plums,” “mare’s eggs”



Colonies consist of unbranched filaments in a firm gelatinous matrix

Filaments have heterocytes – *Nostoc* uses them to fix atmospheric nitrogen



Nostoc zetterstedtii: “lake blackberries”

Rare! Red-list species in Europe

Prefers *Lobelia* & *Isoetes* lakes (oligotrophic, clear water)

Replaced by *N. pruniforme* as lake water becomes more eutrophic



Please let me know if you find *N. zetterstedtii* or *N. pruniforme*! Gina.LaLiberte@wisconsin.gov

Nostoc commune



Terrestrial!

Star jelly, witches' butter
French: Crachat de lune
(moon spit)

Outer mucilage layer
often dark yellow

Black and crispy when
dehydrated
Rehydrates & is more
noticeable after rain



That's not goose poop!



COULD BE MISTAKEN FOR NOSTOC: *Ophrydium versatile*

Colonial protozoan

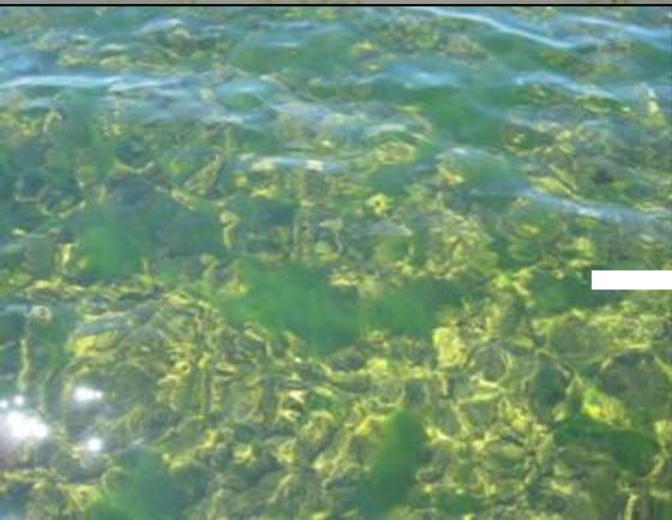
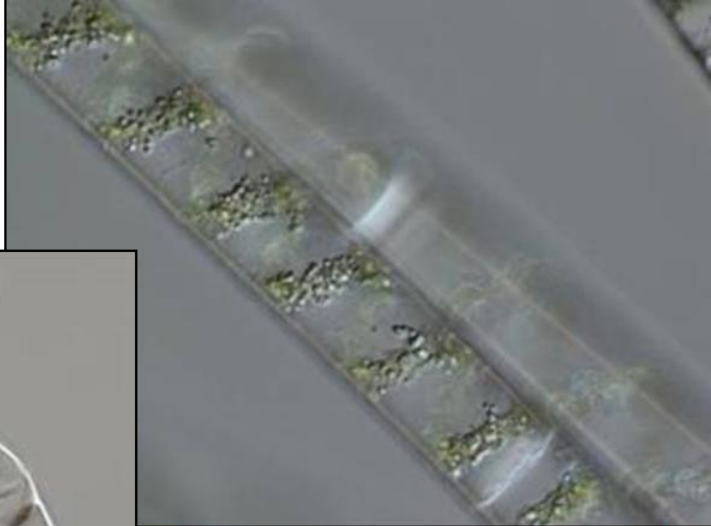
Internal symbiotic algae (*Zoochlorella*) give colonies their green color

Soft, gelatinous texture

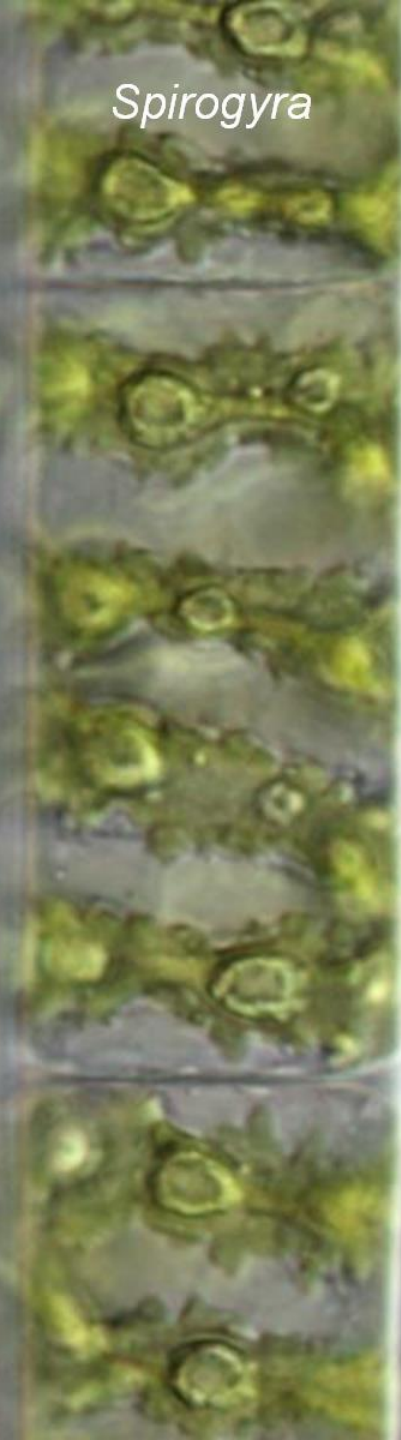
Colony may be attached to plants, on the lake bottom, or broken free and floating



Unbranched filamentous green algae:
Spirogyra and relatives *Mougeotia*, *Zygnema*
“water silk,” “frog spit”
Secretes pectin, giving it a slippery texture



Spirogyra



Mougeotia



Zygnema

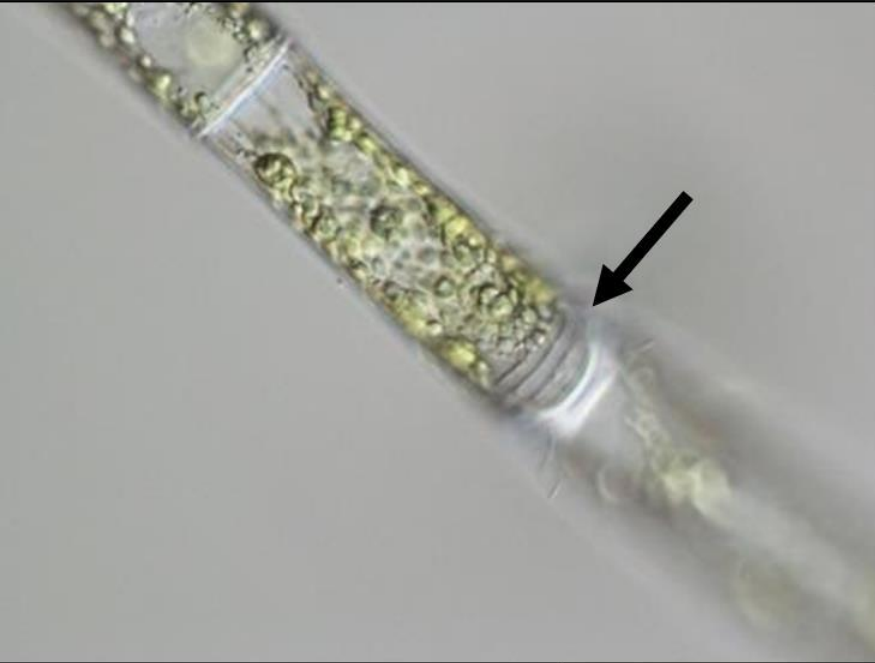


Unbranched filamentous green algae: *Oedogonium*

Often covered with epiphytic algae and mixed in with other filamentous greens

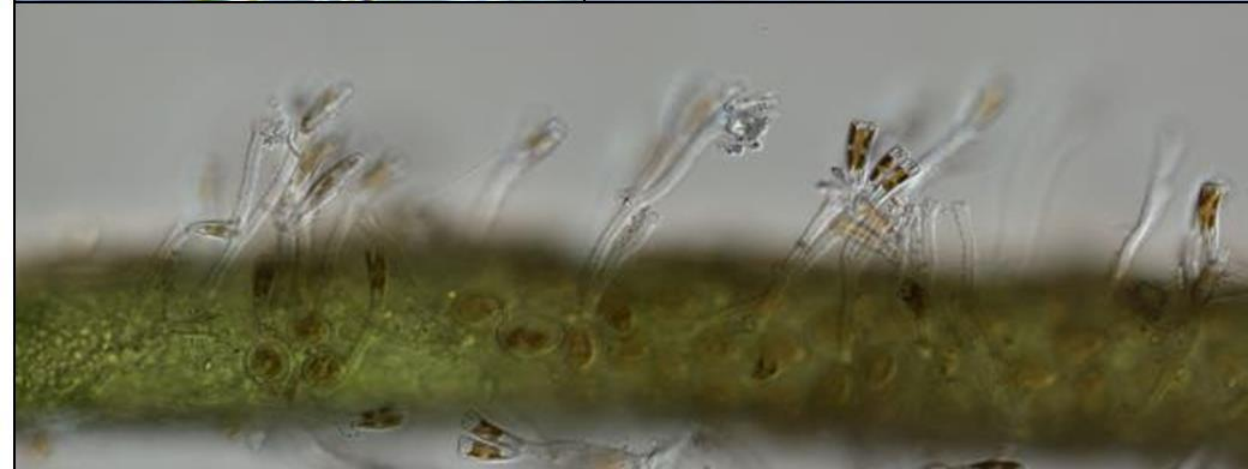
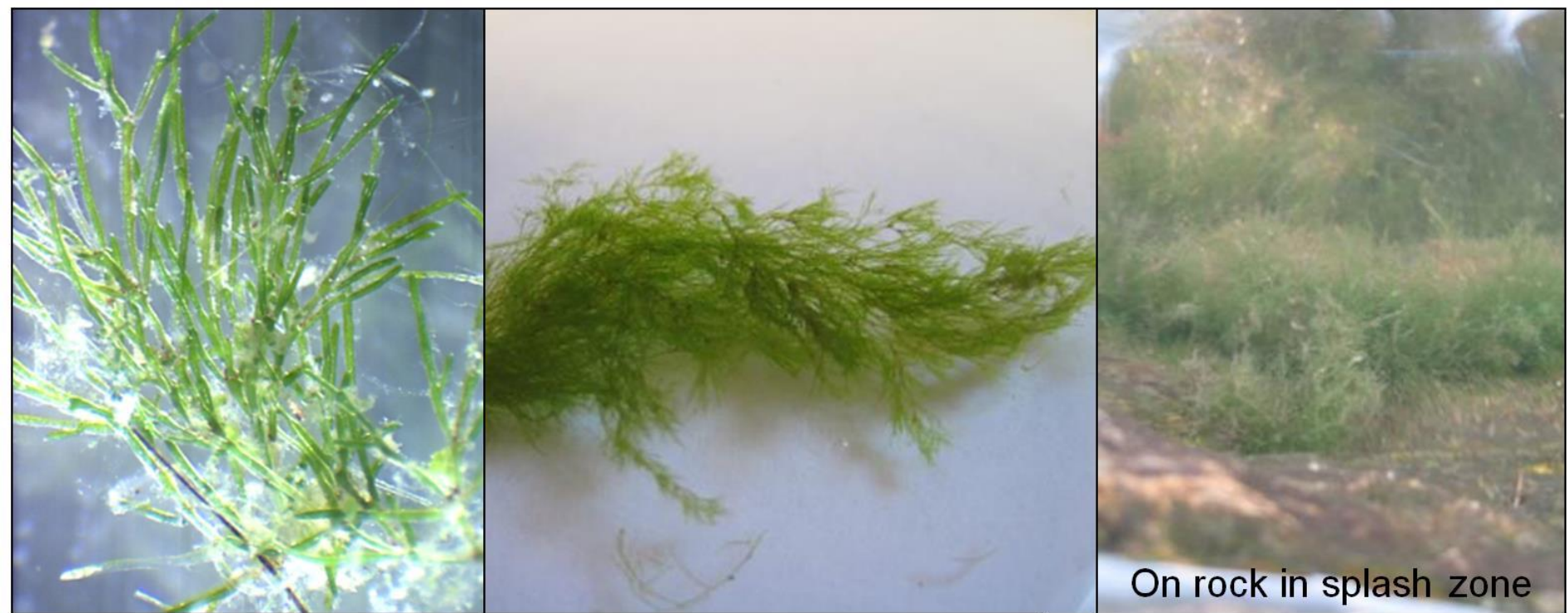
Microscope needed for identification

Rings of apical caps from cell division are a key diagnostic feature



Branched filamentous green algae: *Cladophora*

Microscope needed for identification, but cottony, highly branched greens on hard substrates at lake margins are usually *Cladophora*



Can be highly branched or have minimal branching.

Older portions are often covered with algal epiphytes. Diatoms make it appear to be a golden-brown color

Branched filamentous green algae: *Cladophora* & *Rhizoclonium*

Microscope needed for identification

Phenotypically plastic so they are difficult to identify to species

Cladophora species with minimal branching are confused with related *Rhizoclonium*

Often entangled with macrophytes or forming nuisance growths

Large, coarse filaments (>40 μm diameter) are most likely *Cladophora*



Branched filamentous green algae: *Pithophora*

Microscope needed for identification

Branching and coarse, rough texture.

Also known as “horsehair algae.”

Branches are at right angles and cells are long. Resting cells appear as dark ovals. Notorious for forming nuisance growths entangled in plants or floating.



Resting cells

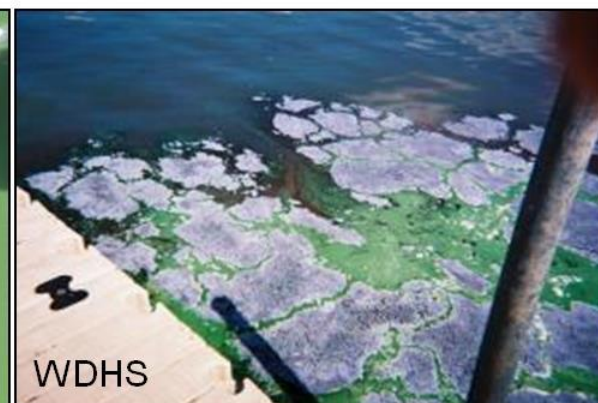


Let's look at algae!



Hazards of blue-green algae blooms

- They may form nuisance blooms.
- Blooms impact aquatic life.
- Some strains can make liver, cell, or nerve toxins if conditions are right.
- Toxins may irritate the skin in sensitive individuals; swallowing or inhaling them in water can cause illness.
- **Not all blue-green algae make toxins, and toxins are not made all the time.**



What causes harmful blooms?

- Excess nutrients are fertilizer for growth
- Primarily P, but N can be important too
- Warm water and calm weather



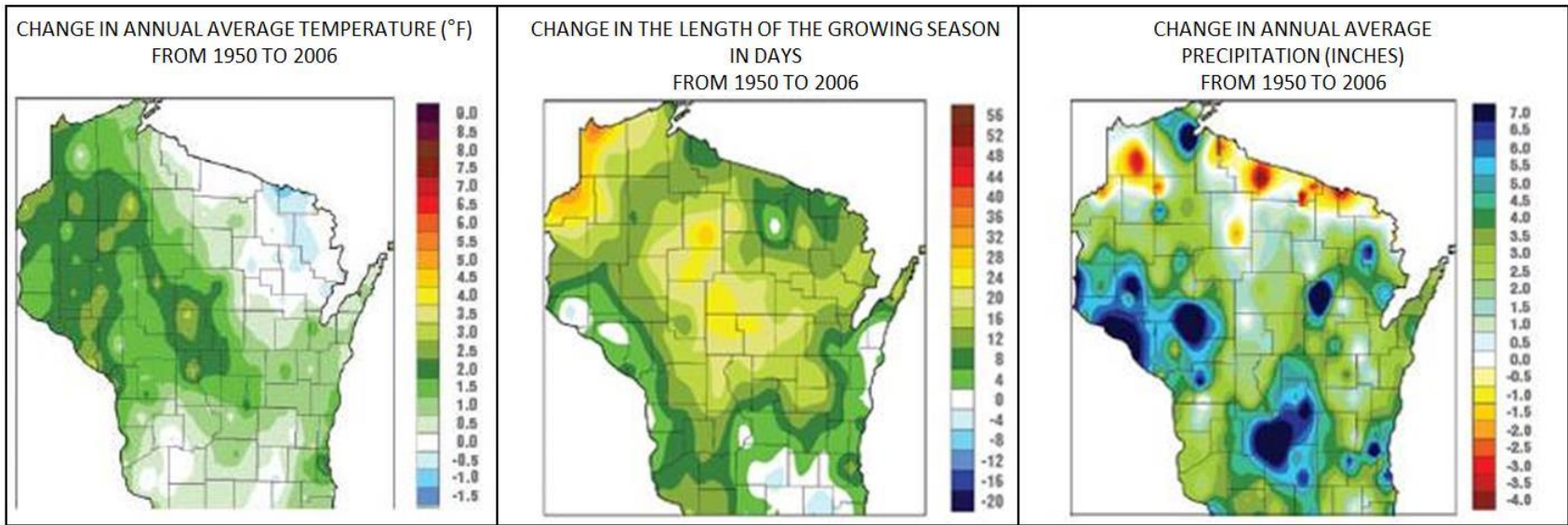
The details are more complicated...

- Species and strains
- Cell biochemistry
- Micronutrients (iron)
- Dissolved carbon
- Zebra & quagga mussels
- Nutrients & cells from lake sediments
- Herbicides?



“Favorable environmental conditions”
– Mark Vander Borgh, NCDENR

Are blooms more frequent?



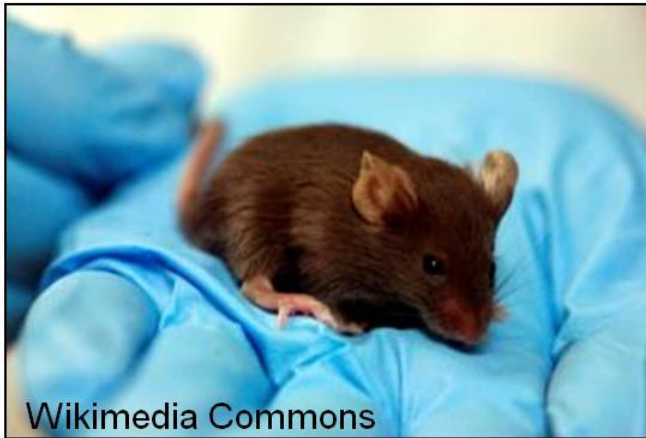
- Yes – worldwide evidence
- Heavy rains & snowmelt: extra nutrients
- Drought –lower, warmer water
- Earlier warming & extended warming may lead to blooms

How do I get rid of it?

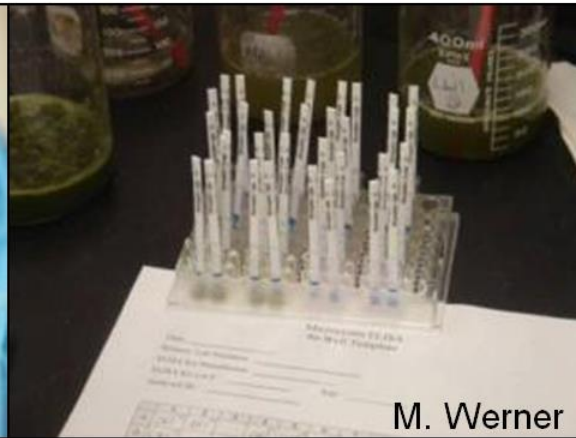
- Chemical treatment usually not permitted – killed cells can release toxins in 1 big dose.
- Other “solutions” are often ineffective or treat the symptom, not the cause.
- Reduce nutrient input, but internal loading can continue to fuel blooms.

Are blooms more toxic?

- New technology means we continue to learn more
- Ongoing research to identify toxins and their production pathways



Wikimedia Commons



M. Werner



Agilent.com

Toxins

- We have a good idea of what common planktonic species contain strains that can make toxins.
- We know much less about uncommon or infrequently occurring species.
- About 2700 described species worldwide.
- Research carefully – unless you know the full story, inadequate information may cause you undue concern.

Toxin information online

- Assess your information sources.
- Papers – “toxic bloom-formers” without testing for toxins, or non-toxic taxa lumped in with toxic.
- E.g. *Nostoc zetterstedtii*.

How to tell if it's safe?

- What does the water look like?
- Can you see your feet?
- How does it smell?
- For pets, does the water look like something YOU would want in your mouth?

- Has there been a recent heavy rain?
(higher bacteria levels)

Who is at risk

- Children, especially small children.
- People with compromised immune systems.
- People with allergies may have greater sensitivity.

Can I do my own testing?

- Yes – Wisconsin State Laboratory of Hygiene
- Keep in mind bloom may change significantly between time of collection and when results are available – concentration, toxin production
- Posting advisories should be left to public health officials

Who issues advisories?

Chapter 254.46 Beaches. The department or a **local health department** shall close or restrict swimming, diving and recreational bathing if a human health hazard exists in any area used for those purposes on a body of water and on associated land and shall require the posting of the area.



DNR has the responsibility for advisories at State Park and State Forest properties.

US EPA *Draft* Recreational Guidelines

Draft Recreational Advisory Levels for Cyanotoxins	
Microcystins (MC)	Cylindrospermopsin (CYN)
4 µg/L	8 µg/L

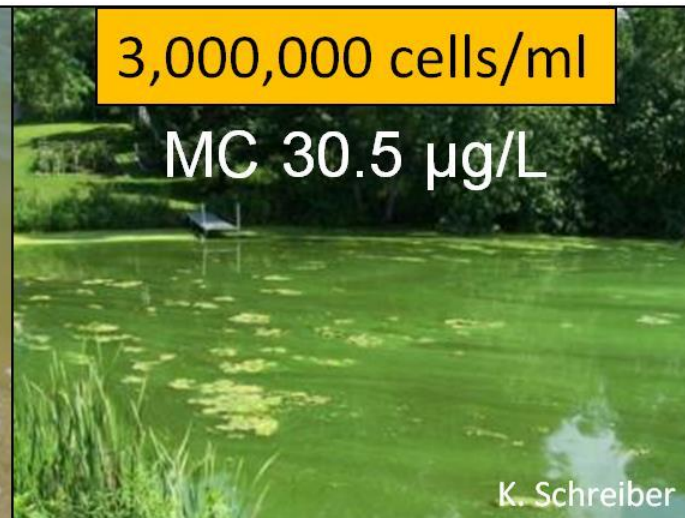
Swimming Advisory: not to be exceeded on any day
(also dually proposed as Ambient Water Quality Criteria)

- Based on toxins' **chronic** effects on target organs (liver, kidney), not on **acute** effects (e.g., allergic reactions, vomiting, diarrhea).
- Take children's smaller size into account.
- Not enough data to determine cell densities or pigment levels (chlorophyll or phycocyanin) correlated with these toxin concentrations.

WHO Recreational Guidelines

Probability of Adverse Health Effects	Cell Density (cells/ml)	Microcystin-LR ($\mu\text{g/L}$)	Chlorophyll ($\mu\text{g/L}$)
Low	< 20,000	< 10	< 10
Moderate	20,000-100,000	10 – 20	10 – 50
High	100,000-10,000,000	20 – 2,000	50 – 5,000
Very High	> 10,000,000	> 2,000	> 5,000

Graham *et al.* 2009, based on WHO 2003 *Guidelines for Safe Recreational Water Environments*



Signage – Mixed Interpretation by Public?



HEALTH ALERT

Toxic blue-green algae may be present in this area.

Avoid swallowing lake water and do not touch algal scums. Keep pets away from the water.

Do not swim in areas where you cannot see your feet in knee-deep water.

Be alert! Avoid water that:

- Looks like pea soup or spilled paint
- Is discolored or has colored streaks
- Has surface scums, mats, or films
- Has green dots or globs floating below the surface

For more information, call your local health department or visit
<http://dnr.wi.gov> or <http://www.dhs.wisconsin.gov>

DEPARTMENT OF HEALTH SERVICES, Division of Public Health
Bureau of Environmental and Occupational Health, P-01082 (08/2015)

Sandusky Bay, Lake Erie



B. Culler, ODNR

Communication Caveats

- DON'T terrify your audience.
- Know who has the responsibility for issuing advisories. ALWAYS work with local public health officials (county or municipal) if there is a need to communicate risk to the public for a given water body.
- Be absolutely certain that a “bloom” is actually cyanobacteria!
- Recognize that conditions can change rapidly, so results may not reflect current conditions.
- Learn to identify impaired conditions, but recognize that toxins may persist after blooms abate, or may be produced by less noticeable benthic cyanobacteria.

Are they toxic? Can I even go in the water?



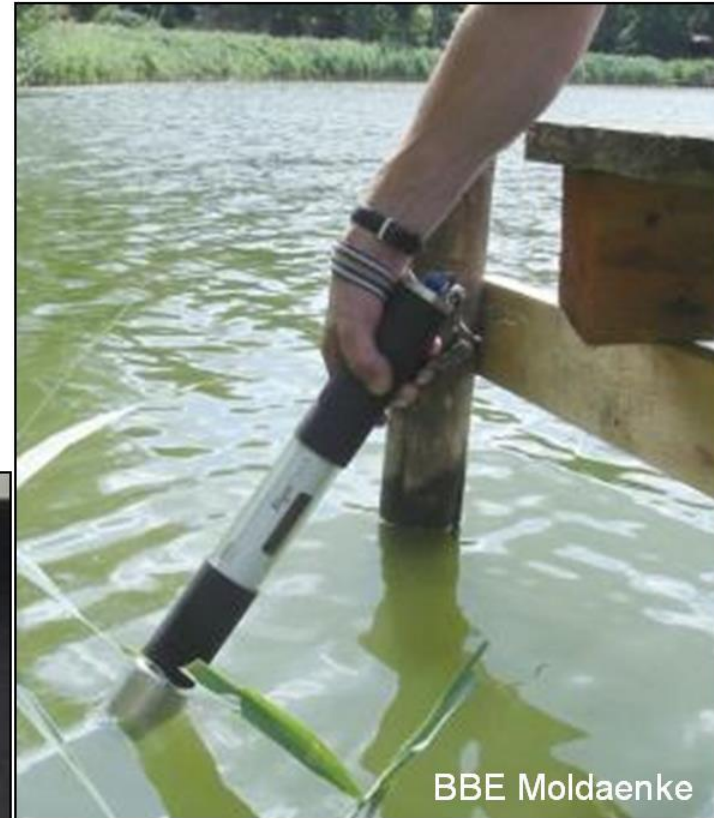
Can't we test more?

Blooms change rapidly

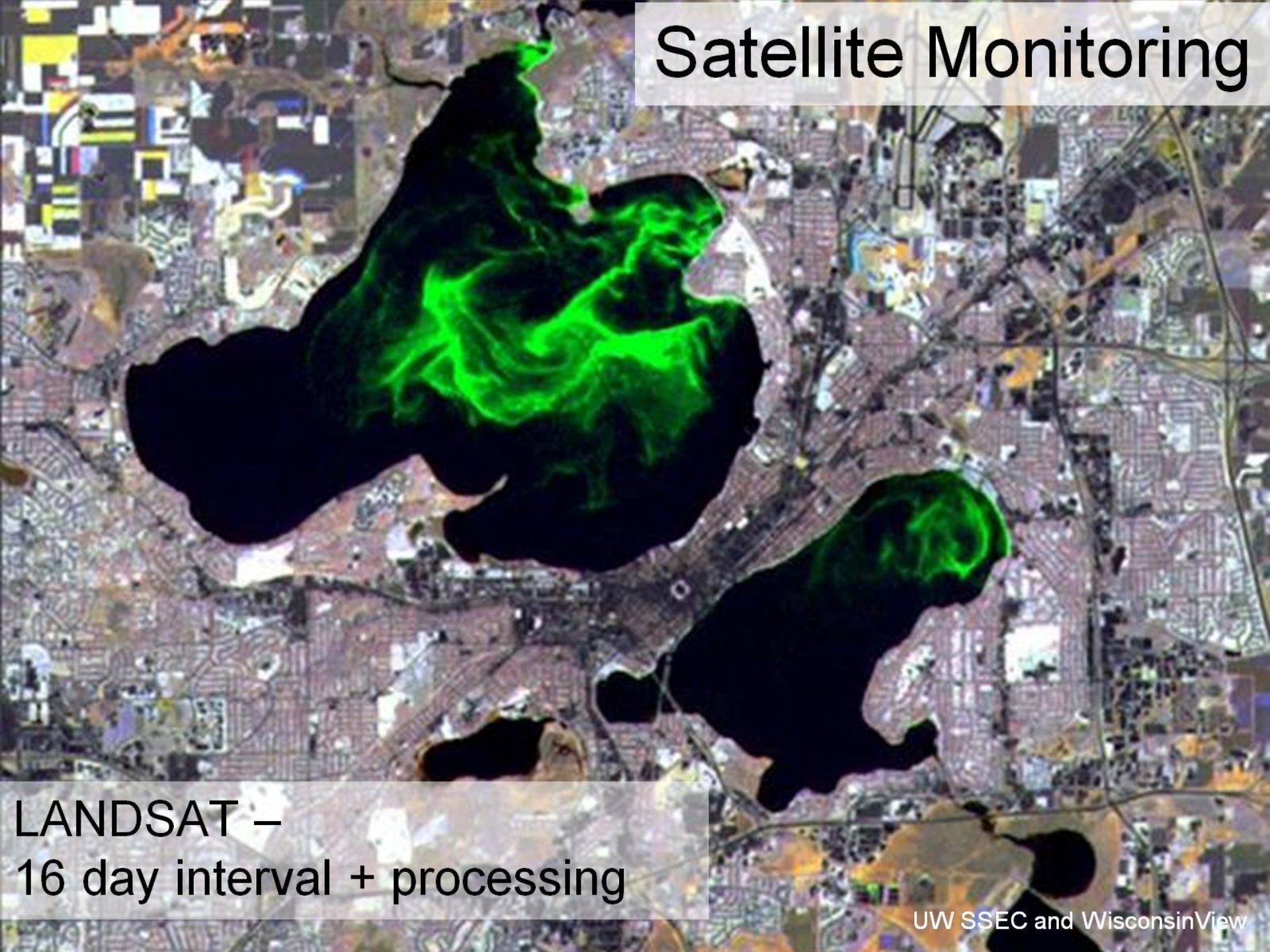
Results delayed

Expensive!

Where to test on a large lake?



Satellite Monitoring



LANDSAT –
16 day interval + processing

Lake Erie Harmful Algal Bloom Forecast



Lake Erie Harmful Algal Bloom Bulletin

25 September, 2017, Bulletin 22

The *Microcystis* cyanobacteria bloom continues in the western basin along- and offshore the Michigan and Ohio coasts from Maumee Bay east into the central basin, and northeast to the Ontario coast. Observed winds since Thursday (9/21-9/25) caused an increase in surface concentrations. Scums were visible within Maumee Bay extending northeast to the Ontario coast. Measured toxin concentrations are below recreational thresholds throughout most of the bloom extent, but concentrations can exceed the threshold within Maumee Bay and in the western basin extending towards the Ontario coast where the bloom is most dense (appearing green from a boat).

Forecast winds (2-5kn) today through Wednesday (9/25-9/27) may increase the potential for scum formation. Forecast winds today through Thursday (9/25-9/28) may limit the transport of remaining *Microcystis* concentrations.

Please check Ohio EPA's site on harmful algal blooms for safety information: <http://epa.ohio.gov/habalgae.aspx>. Keep your pets and yourself out of the water in areas where scum is forming. NOAA's GLERL provides additional HAB data: https://www.glerl.noaa.gov/res/HABs_and_Hypoxia. The persistent cyanobacteria bloom in Sandusky Bay continues. -Davis, Laline

The images below are "GeoPDF". To see the longitude and latitude under your cursor, select "Tools > Analyze > Geospatial Location Tool".

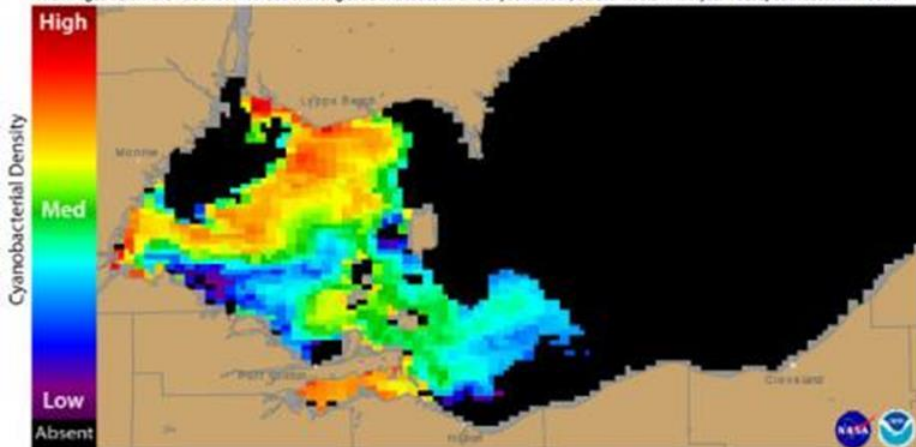


Figure 1. Cyanobacterial index from NASA MODIS-Terra data collected 24 September, 2017 at 11:55 EST. Grey indicates clouds or missing data. The estimated threshold for cyanobacteria detection is 20,000 cells/mL.

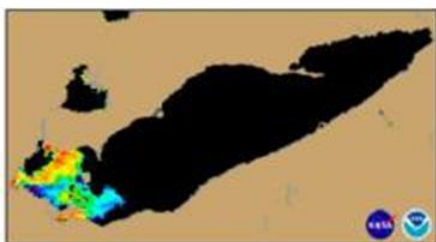


Figure 2. Cyanobacterial Index from NASA MODIS-Terra data collected 24 September, 2017 at 11:55.



Wind speed and direction from Marblehead, OH. Blooms mix through the water column at wind speeds greater than 15 knots (or 7.7 m/s).

For more information and to subscribe to this bulletin, go to: <https://tidesandcurrents.noaa.gov/hab/lakeerie.html>

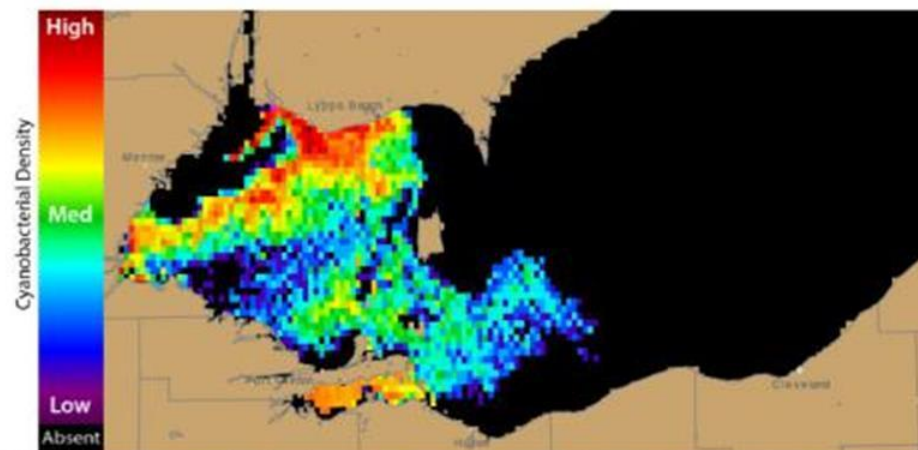


Figure 3. Nowcast position of bloom for 25 September, 2017 using GLFS modelled currents to move the bloom from the 24 September, 2017

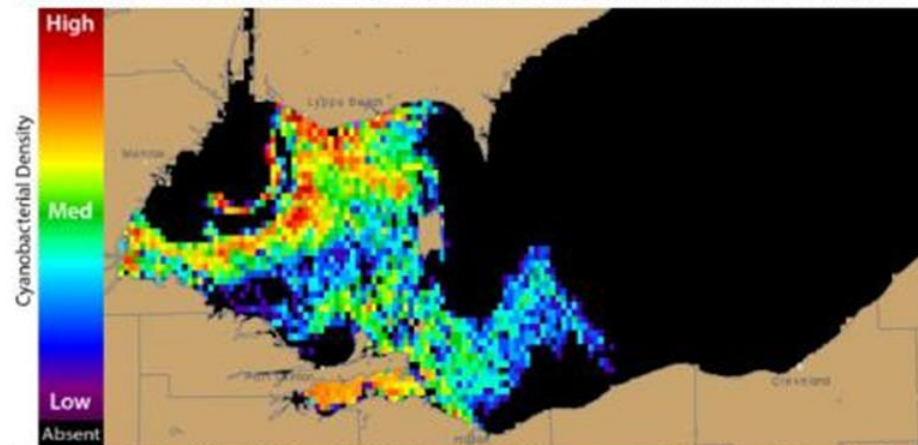
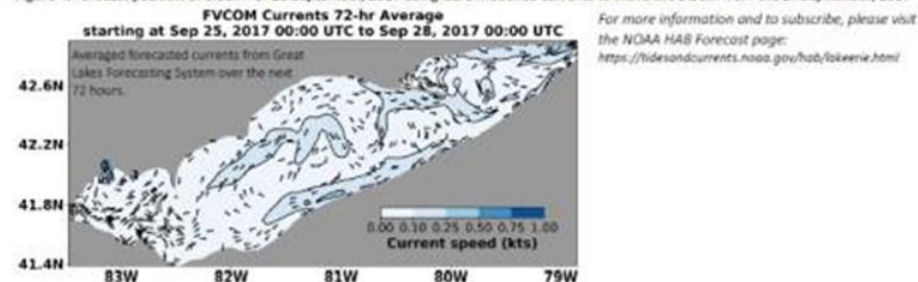


Figure 4. Forecast position of bloom for 28 September, 2017 using GLFS modelled currents to move the bloom from the 24 September, 2017



For more information and to subscribe, please visit the NOAA HAB Forecast page: <https://tidesandcurrents.noaa.gov/hab/lakeerie.html>

Lake Erie Harmful Algal Bloom Forecast

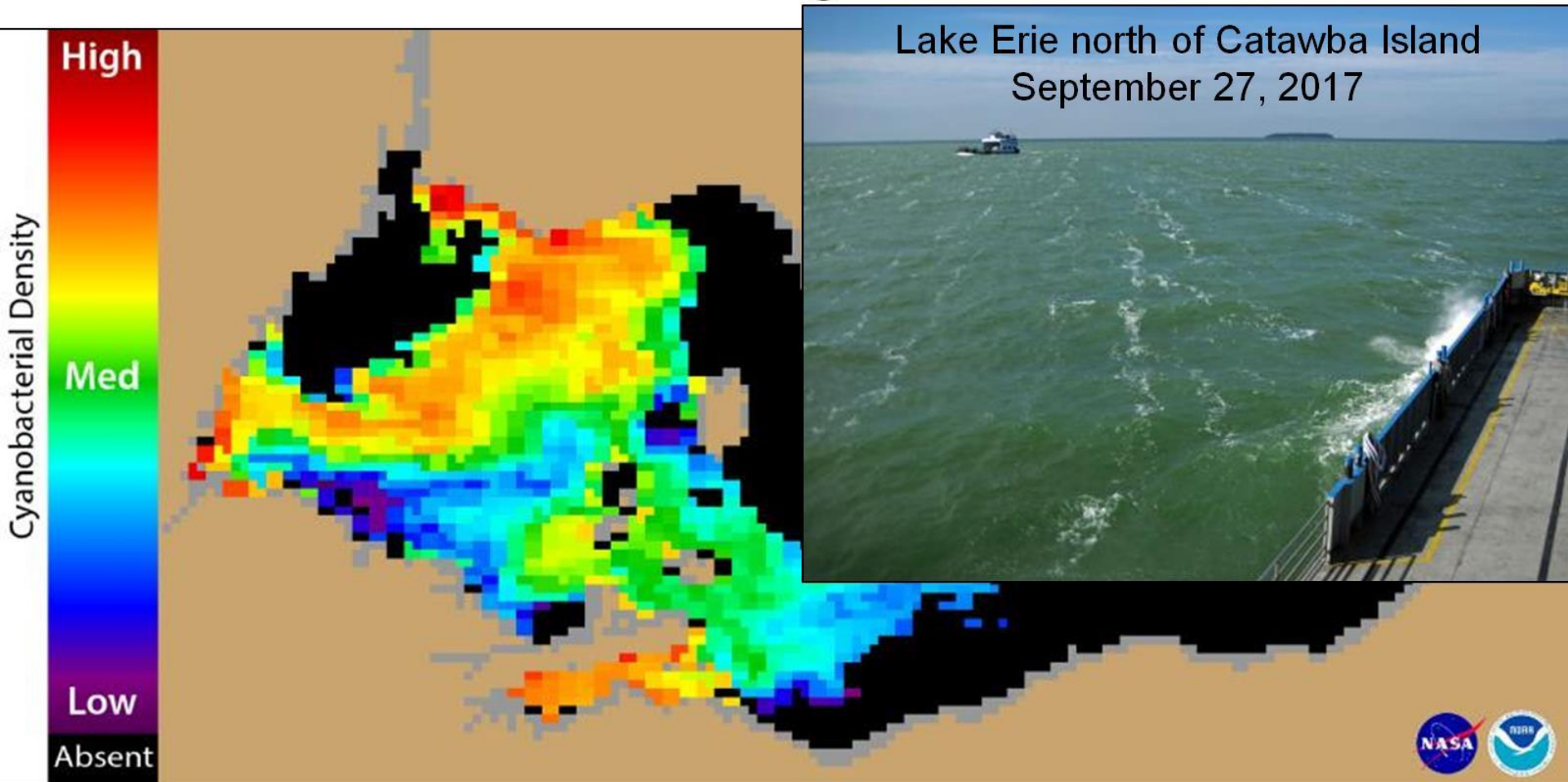
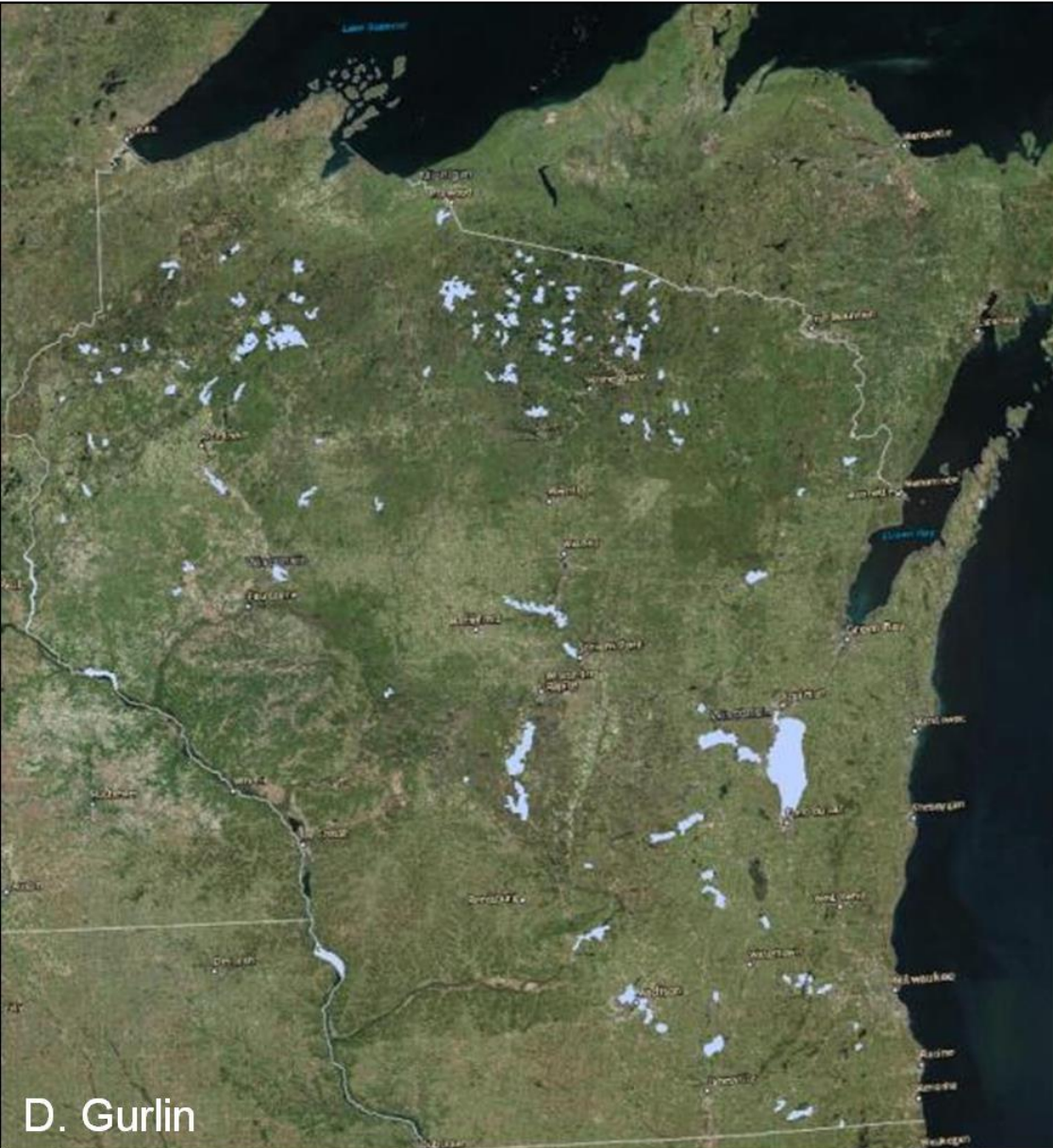


Figure 1. Cyanobacterial Index from NASA MODIS-Terra data collected 24 September, 2017 at 11:55 EST. Grey indicates clouds or missing data.

The estimated threshold for cyanobacteria detection is 20,000 cells/mL.

https://tidesandcurrents.noaa.gov/hab/lakeerie_bulletins/HAB20170925_2017022_LE.pdf

Cyanobacteria Assessment Network



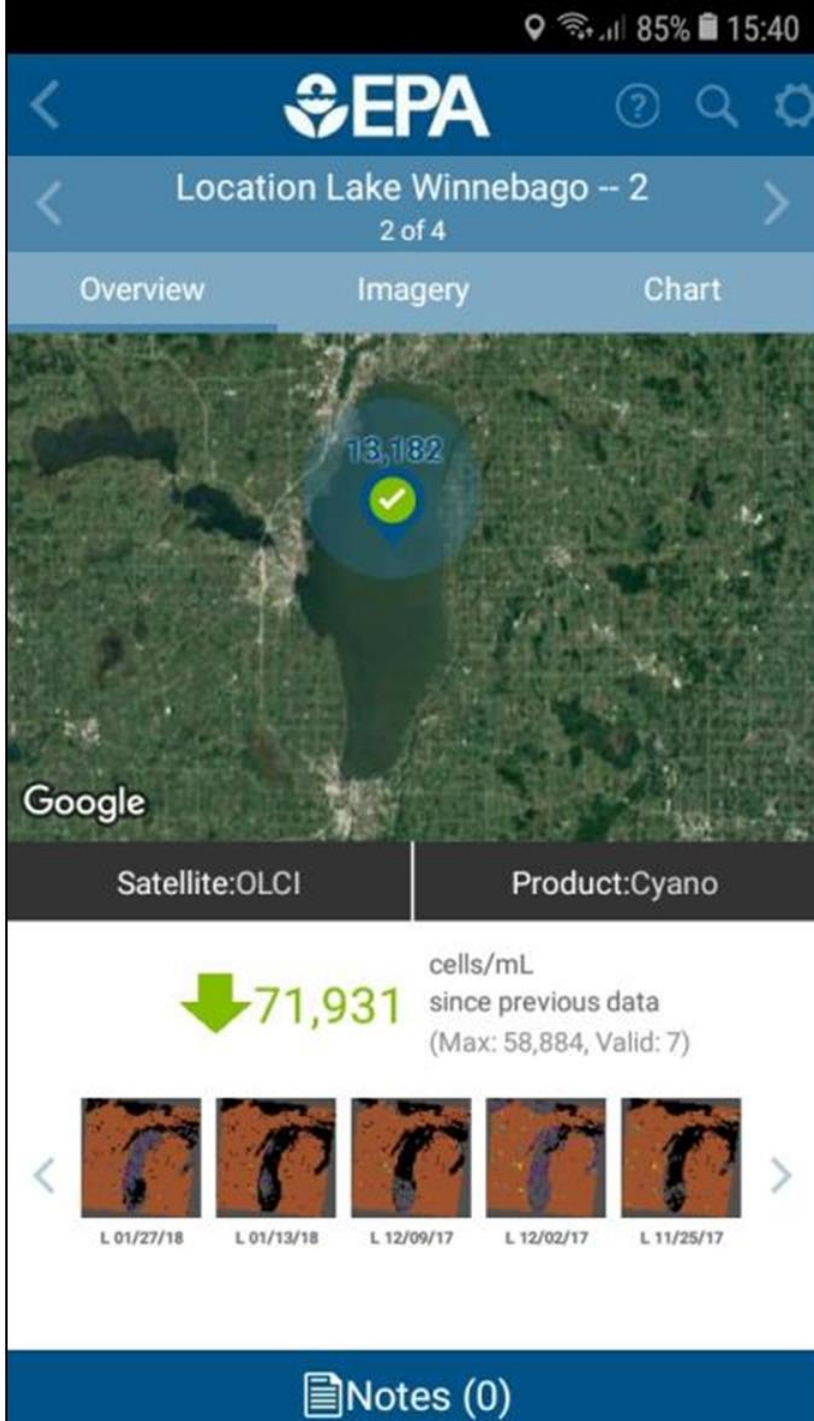
EPA, NASA, NOAA, & USGS

Data from NASA/USGS
LANDSAT & European Space
Agency Sentinel satellite
missions

Most inland lakes are too
small for satellite monitoring.

**Toxins cannot be detected
via remote sensing.**

Android app in beta testing.



Composite cyanobacteria cell count maximums (over 1 week) updated weekly

Known issues:

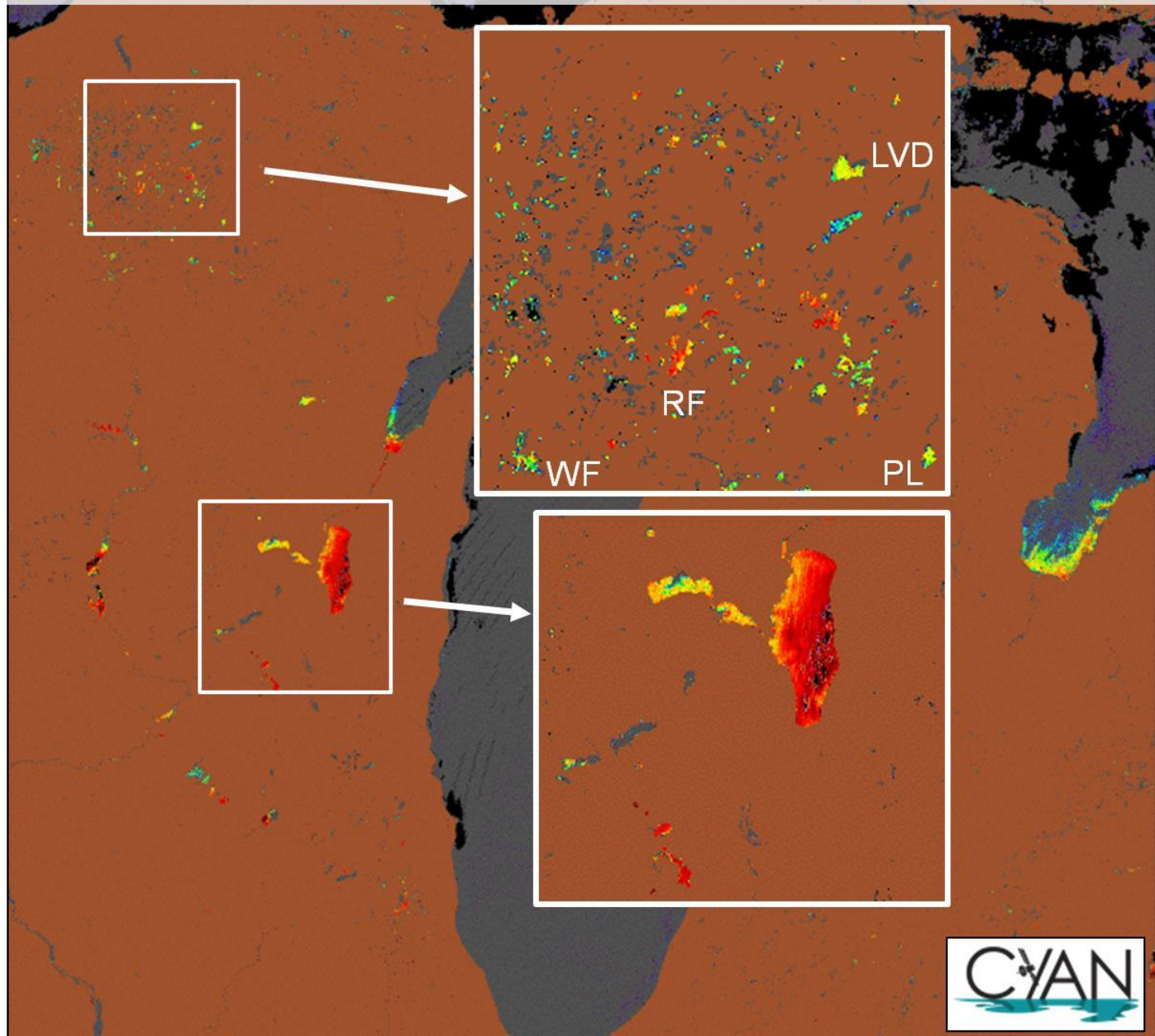
Lag in data availability from ESA

Ice & thin clouds may register as blooms

Data better for lakes > 900m (0.56 mile)

Should be considered a research level tool

7-day composite value from August 27, 2017 through September 2, 2017



Are they toxic? Can I even go in the water?

Knowing instantaneously if toxins are not present, or if the cyanobacterial population does not have toxin genes, is the only way to be certain that it is safe.

We're not there... yet.

The tricorder reading indicates a high level of cyanobacterial toxins.



For now, common sense applies.

Can you see your feet in knee-deep water?



Avoid water that resembles a green milkshake, pea soup, or paint.



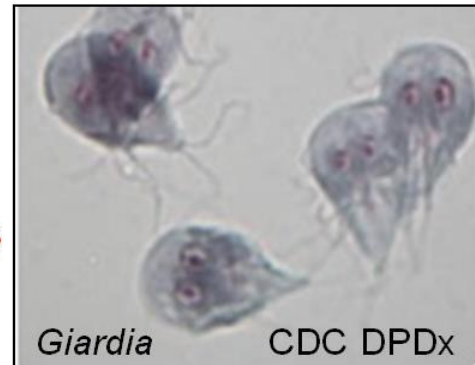
T. Bridgeman
University of Toledo

Smell earthy or musty odors? Toxins might be present.



Burpee.com

Graham et al. 2010: geosmin & MIB co-occurred with toxins <http://bit.ly/1dPjZGC>
Cyanotoxins can still be present without odors



Choose the clearest water possible for swimming.
Try to avoid swallowing water, no matter how clean it looks, especially after a rainstorm!

Sometimes the risk is obvious.



2014 North Carolina
Division of Water Quality

If there's no public health testing, how can you stay safe?

Learn what to look for.

Use common sense.

Avoid submerging your head if water contains lots of particles or debris.

This will help to protect you from other bacteria, viruses, and parasites.

Keep water out of your mouth!

10 μm

A microscopic image showing a large number of rod-shaped bacteria, likely Bacillus or Clostridium species, scattered across the field of view. The bacteria are of various lengths and orientations. A vertical scale bar on the right side of the image indicates a length of 10 micrometers.

You can see the blooms that are of highest concern

Planktonic (free-floating) blooms are visible either as surface scums or mixed into water in high concentration (“pea soup” appearance)

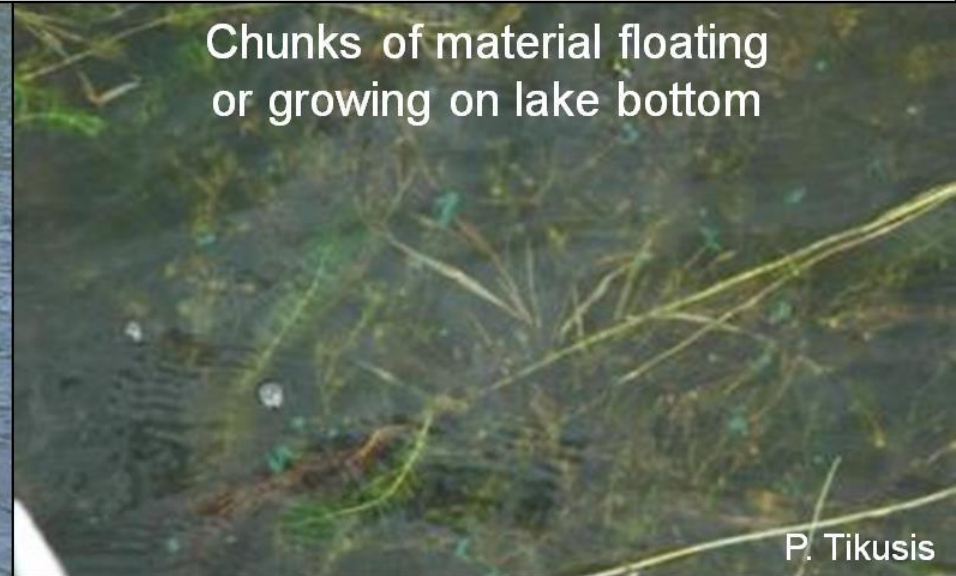


What about other situations?

Blooms patchy or in small areas

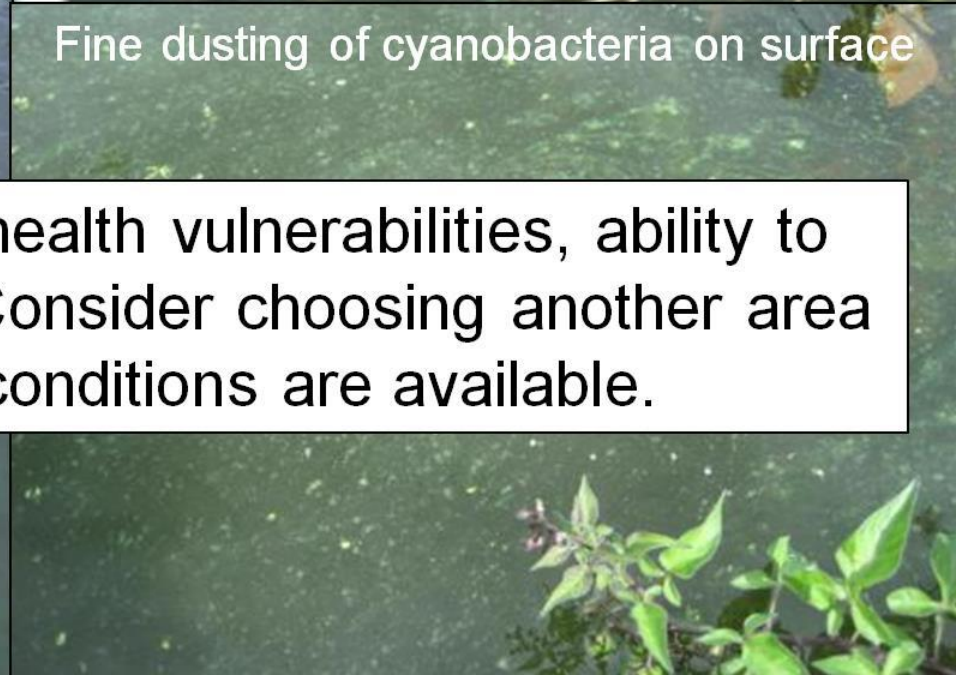


Chunks of material floating or growing on lake bottom



P. Tikusis

Fine dusting of cyanobacteria on surface



Judgment call – account for health vulnerabilities, ability to keep water out of the mouth. Consider choosing another area for recreation if better conditions are available.

How to be safe?

- Avoid swimming in and boating through blue-green algal scums and “pea soup” water.
- **Can you see your feet in knee-deep water?** If not, avoid ingesting any water.
- Choose the **clearest** water possible for small children and pets.
- Always shower after swimming in a lake, river, or pond.
- Try to avoid swallowing water, no matter how clean it looks (especially after a rainstorm!)



K. Schreiber, WDNR



**When in doubt,
keep out!**

Keep your pets safe!

- Animals don't instinctively know if water is safe.
- Provide clean drinking water.
- Keep pets out of scummy water, and wash them off immediately after they swim.
- Don't allow dogs to eat dried scum on shore or floating mats.



Business Licenses & Regulations Recreation Env. Protection Contact Join DNR

Blue-Green Algae

General Humans & Animals Drinking Water Recreation Protect Yourself Resources

Contact and General Information

If you think you are experiencing symptoms related to exposure to blue-green algae (e.g., stomach cramps, diarrhea, vomiting, headache, fever, muscle weakness, difficulty breathing), contact your doctor or the Poison Information Hotline (800-222-1222) right away.

If your pet displays symptoms such as seizures, vomiting, or diarrhea after contact with surface water, contact your veterinarian right away.

Report a Case with potential health effects caused by blue-green algae, visit the [Department of Health Services \(ask user\)](#), or contact the Bureau of Environmental and Occupational Health at 608-266-1120.

For more information about contacting your local health department, check the [Department of Health Services Web site \(ask user\)](#).

If you are (or your local community is) interested in collecting samples for analysis, please contact the **Wisconsin State Laboratory of Hygiene at (800)442-4618**. The Wisconsin Department of Natural Resources is not currently conducting any routine monitoring for blue-green algae or blue-green algal toxins.

What are blue-green algae?


Blue-green algae, also known as Cyanobacteria, are a group of photosynthetic bacteria that many people refer to as "pond scum." Blue-green algae are most often blue-green in color, but can also be blue, green, reddish-purple, or brown. Blue-green algae generally grow in lakes, ponds, and slow-moving streams when the water is warm and enriched with nutrients like phosphorus or nitrogen.

When environmental conditions are just right, blue-green algae can grow very quickly in number. Most species are buoyant and will float to the surface, where they form scum layers or floating mats. When this happens, we call this a "blue-green algae bloom." In Wisconsin, blue-green algae blooms generally occur between mid-June and late September, although in rare instances, blooms have been observed in winter, even under the ice.

Lake Name:

Lakes

Find a lake.



Blue-green algae blooms appeared earlier and in more lakes this summer than usual. Learn more about these blooms and the health risks they can pose.

Contact information

For information on Lakes in Wisconsin, contact:

[Wisconsin DNR Lakes](#)
Division of Water
Bureau of Water Quality

[Blue-Green Algae Contacts](#)

For more information:
dnr.wi.gov
 Search for "algae"

Find me in the
 blue-green algae contacts



- DNR and DHS are tracking blooms and related illnesses.

Please let me know about bloom events!

Gina.LaLiberte@wisconsin.gov

- DNR cannot test for each bloom, but knowledge of blooms helps us to track where HABs are a public health burden.
- Most bloom-tracking apps/websites DO NOT report to DNR.
- The exception is bloomWatch: <https://cyanos.org/bloomwatch/> BUT follow-up information by states to bloom reporters is not supported.

The screenshot shows the Wisconsin Department of Health Services website. The header includes the DHS logo and a search bar. The main navigation bar lists various services: About DHS, Data & Statistics, Diseases & Conditions, Health Care & Coverage, Long Term Care & Support, Prevention & Healthy Living, Partners & Providers, and Certification, Licenses & Permits. Below this is a 'Topics A-Z' menu. The current page is titled 'Blue-Green Algae' and features a sidebar with links like 'Understanding Algae', 'Health Concerns', and 'Algal Bloom Photos'. The main content area includes a social media sharing bar, a photo of green algae, and text explaining the reporting process for harmful algal blooms (HABs). It provides contact information: 608-266-1120 and a link to the 'Harmful Algae Bloom (HAB) Illness or Sighting Survey, F-02152'. A grey box at the bottom of the page contains the text 'When in doubt, stay out!' and a footer note 'Last Revised: September 25, 2017'.

To **report illnesses** in people or animals:
dhs.wisconsin.gov
Search for “algae”
Or call 608-266-1120

- DNR and DHS are tracking blooms and related illnesses.
Please report illnesses in people or animals at the DHS website!
- Timely reporting is essential for follow-up sampling & testing.
- We may not be able to sample and test for each case, but knowledge of blooms helps us to track where HABs are a public health burden.
- *Sampling & testing are not intended for routine monitoring purposes.*